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Coal and Ore Loading Plant, New Rhine Harbor

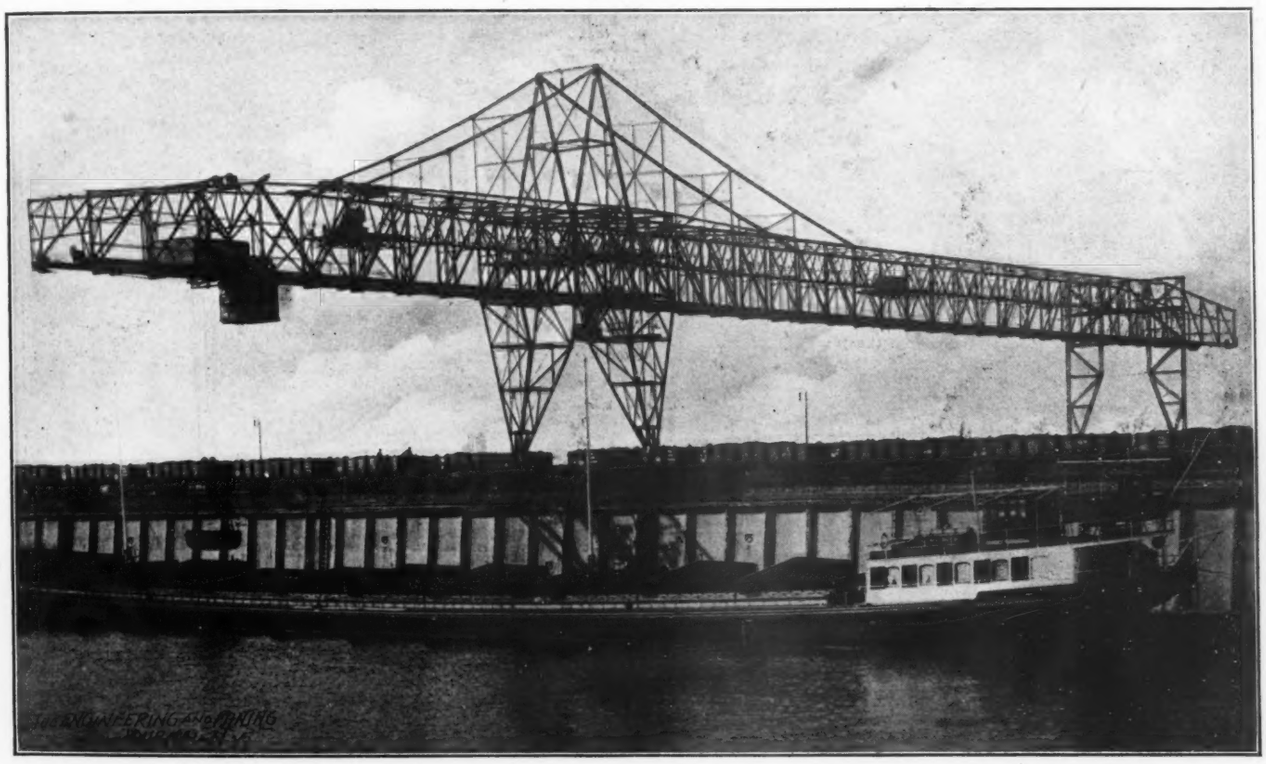
Plant Comprises Six Swing, Two Double Jib and Two Bridge Cranes; Capacities Vary from Six to Eight Tons. All Steel Construction Used.

BY J. B. VAN BRUSSEL*

The accompanying illustrations refer to a large plant for the handling of ore, coal and iron, between railways, steamer and stockyard, which has recently been erected at the new Rhine harbor, Schwelgern, near Bruckhausen, Germany. The plant, which is the property of the Gewerkschaft Deutscher Kaiser, of Hamborn, comprises six traveling swing cranes, mounted on the quay wall; two large traveling cranes, with double jibs, which run on parallel tracks and serve the stockyard, which is laid with railway tracks and reaches up to the quay wall; and two other traveling bridges extend over additional stockyards abutting on the quay walls of the harbor bays. The double-jib cranes and bridges deal chiefly with material passing between ships and the stockyards, and their outer ends project over the edge of the quay; the tracks supporting the crabs, are mounted at sufficient hight to enable the swing cranes which effect the transference of goods from ship to rails, to pass underneath. In all cases the hoisting plant is fitted with hinged buckets or self-acting grabs, according to the class of goods to be handled, and they can also be equipped for dealing with piece goods, such as iron.

Swing Cranes

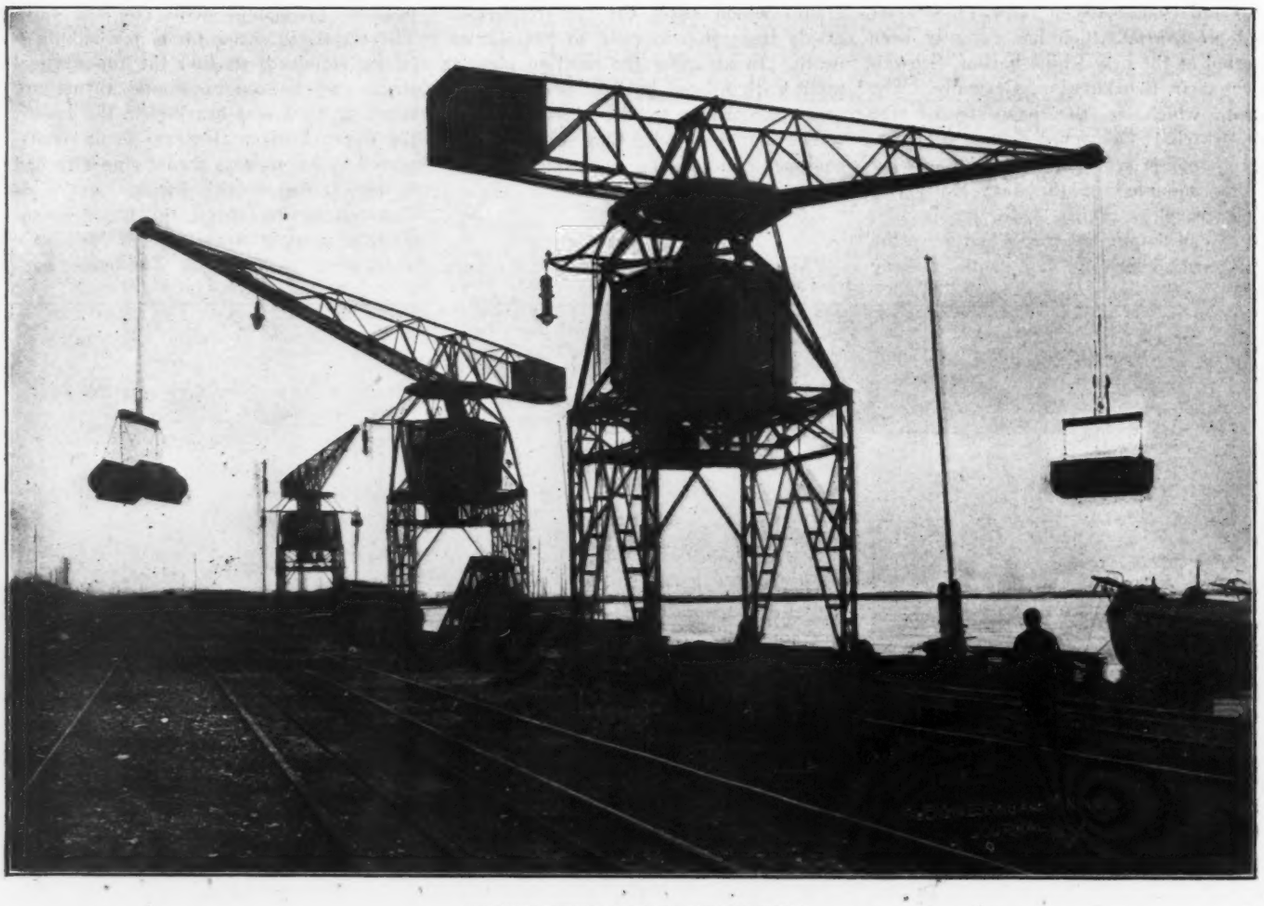
The lifting capacity of the swing cranes is six tons. Four of them have a reach of 48 ft. and the other two 51 ft. The hight above the rails is 49 ft., and the distance between the track rails 16 ft. The lattice frame rests on four wheels, power being transmitted to one wheel on each side, through worm and pinion gearing, from a motor above. A motor-operated band brake holds the frame stationary in any position, and prevents it from shifting under the influence of the wind. When not in use, the cranes are fixed in position by clamps acting on the rails. The counterbalanced jib is pivoted on a lattice standard, so that the top vertical strain and bottom horizontal thrust are taken up by a step bearing on the frame, the upper horizontal strain being transmitted by rollers to a throat ring attached to the frame. The lifting gear is mounted on the swing, the latter consequently turning with the driver's cab, which turns with the jib. The braces connecting the throat bearing with the under frame are mounted so as not to obstruct the view of the driver. The journal of the step bearing is hollow, for the passage of the cable. To reduce the diameter of the lifting ropes, the load is suspended from two ropes, between which the grab rope is arranged. The lifting motor drives the two drums through intermediate pinion gear-



VIEW OF ONE OF THE TRAVELING BRIDGES

*Brussels, Belgium.

ing. The grab rope is wound on a drum between the two lifting drums, a friction clutch causing this drum to turn automatically with the others, while the grab drum can be held in any position, for operating the grab, by a double band brake, which is held off by a brake motor during the raising of the load. This brake is connected with the reversing lever of the lifting switch, and is therefore operated concurrently with the latter. The swing motion is transmitted from the motor through a horizontal worm and pinion, to a toothed crown on the frame; a brake holds the jib in any position and stops it from being blown round by the wind. The switches are mounted at the driver's stand, one of them controlling the lifting, and two fitted with universal control mechanism, for the traveling and swing motions.



SIX-TON SWING CRANES IN POSITION

The Double Jib Cranes

In the large double-jib cranes a lattice tower supports a double-sided lattice girder, carrying the rail track for the crab which has a lifting power of eight tons. The girder projects equally on both sides of the tower. The jibs are hinged on the outer ends of the girder, and can be turned up, to enable the ships to be worked alongside the quays, and also to leave space for the two cranes to pass each other. The crab has a free passageway between the walls of the tower, and has a total traverse of 262 ft. The tower is mounted on 16 wheels, running on a double rail truck 47½ ft. between centers, each track being of 40-in. gage, and the gantry spans three sets of railway tracks. The hight of the crab track above the rails is 49 ft. Power is transmitted to four wheels on each side of the tower from a motor in the middle of the structure, through worm gearing and pinions; and the crane can be kept stationary in any position by a motor-operated brake. To prevent the crane from being displaced by strong winds, motor-operated clamps are provided to grip the rails, the motors for this purpose being, like all the others, controlled from the driver's stand.

The 49-ft. jibs are raised and lowered by a motor situated above the crab track in the tower, and operating winding drums, the ropes from which work in blocks at the rear heads of the jibs. The drums are conical in order to equalize the consumption of power during the raising and lowering of the jibs. The descent is braked by a number of plates, which are pressed together by the axial pressure of the worm shaft. Either jib can be operated by means of a coupling thrown in or out of gear. When the jibs are lowered their weight is supported by articulated fish-plates, thus relieving the strain on the ropes.

The crab carries the lifting and traveling motors, and also the driver's cab, which is slung below the girder, so that the driver always has the load in sight and a clear view over the whole traverse of the crab. The lifting gear is very similar to that on the swing cranes. The traveling motor acts on all four wheels of the crab through intermediate pinion gearing; and a brake is mounted in connection with the motor switch. When the crab reaches the end of the track, the current is shut off automatically; hydraulic buffer stops are provided at the ends. The cab is equipped with the switches controlling the crab motion, and the lateral travel of the crane, while the switch for raising and lowering the jibs is arranged in a cab on the platform; indicators, showing the exact position of the jibs at any time, are also provided there. A stairway in the tower leads to this platform, and also to a footway extending the whole length of the crab track from which the contact rails, through which the current is supplied, can be reached.

Traveling Bridges

The bridges are built of double lattice girders, the upper members of which are

braced together, and carry an internal railtrack for an 8-ton crab. The outer end carries a movable jib. Each bridge is supported at one end on a tower, and at the other on a simple upright lattice frame. The distance of the two supports between centers is 280 ft., the girder projecting 66 ft. beyond the rear support and 90 ft. beyond the tower. The jib at the front end is 54 ft. long so that total length of the crab track is 490 ft. The lower edge of the bridge girder is 41 ft. above the railway track. The tower is mounted on two four-wheel radial bogie trucks, and the rear support on two articulated two-wheel axles. In each case one-half these wheels are actuated by spur and bevel pinion, shafts and intermediate pinion gearing, from a motor in the girder, midway between the two supports. In other details the bridges are similar to the double jib cranes.

periods. The current is supplied through double tripolar live rails laid in iron conduits, with a narrow slit for the passage of the shoes. For lighting, the current passes through a stepdown transformer, to reduce it to 110 volts. The cabs are heated by electricity. The whole installation was carried out by the Maschinenfabrik Augsburg-Nürnberg, to which I am indebted for the illustrations and details.

Conditions in the Urals

By F. W. Draper*

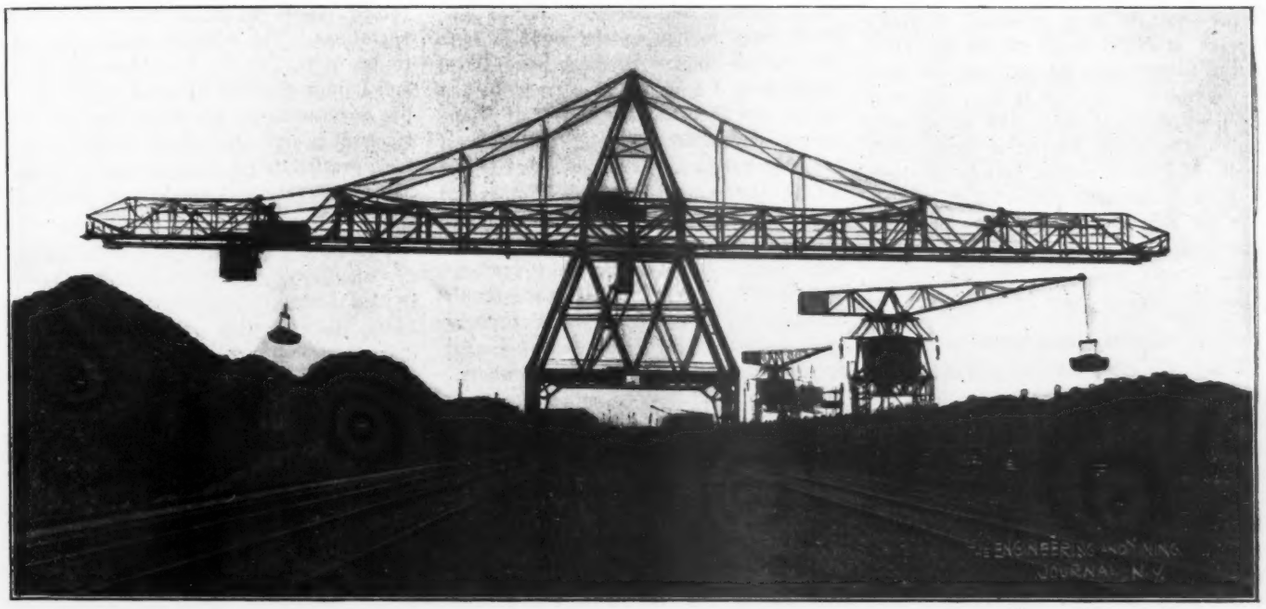
In the article of its London correspondent in the JOURNAL of July 24 regarding investment in Siberian mines, and your editorial comment on that article, the JOURNAL brings up a question which is of great importance both to investors and to the future development of the mining industry in Siberia.

While it is unfortunately true that several British owned enterprises have either come to grief, or have entirely failed to fulfil the promises made at the time of their flotation, the causes lie much more with the methods of flotation than with the mines themselves, and this should not be taken as an indication of the failure of Siberia as a field for safe investment.

Mining Developments

Siberia from the Ural mountains to the Pacific ocean is almost an undeveloped country. Considerable quantities of gold, platinum and copper have been obtained for many years past but the methods of exploitation have been of the crudest, and systematic exploration and development have scarcely been attempted by any native companies. In the Ural mountains, where mining has been carried on for a hundred years or more, in the majority of cases the mines have not reached a depth of over 500 ft., and nothing is known of the orebodies below that depth. The deepest workings in the Urals (at Nijni Tagil) are 966 ft. East of the Urals is a vast stretch of country in which practically no systematic search has been made for metal-bearing veins, although these are known to exist in many places and there are extensive placer areas. Several companies are now working copper deposits in the Kirghiz steppes and it is known that the copper ores are widely distributed.

The present condition of Russian companies in the Ural is most unsatisfactory. The known orebodies are mostly included in very large concessions held from the government on a royalty basis. Until within the last 10 years, most of these concessions yielded very large profits, and were the basis of some large fortunes, but failure to equip and develop the mines properly and to maintain the reduction works has proved fatal, and at the present time, with the exhaustion of the easily and cheaply extracted surface ores, and in competition with better designed plants in other parts of Russia, they are no longer able to conduct operations at a profit. This failure to properly maintain their equipment has resulted in a condition which will require large expenditures of capital to rehabilitate the properties, and place them on a profitable basis; and this capital, the Russians themselves seem unable to provide.



DOUBLE-JIB CRANE IN OPERATION

The lifting speed is 3 ft. per sec. in the swing cranes, 2¼ ft. per sec. in the double-jib cranes, and 3⅛ ft. per sec. in the bridges. The swing cranes turn at a speed of 9¾ ft. per sec. and the travelers on the double-jib cranes and bridges run at a speed of 9¾ ft. and 11½ ft. respectively. The lateral travel of all three classes is 40 in. per sec. and the jibs take 100 sec., in raising and lowering. The lifting motors for both kinds of cranes develop 100 h.p., and those of the bridges 125 h.p. The swing motor is of 15 h.p. and the crab traveling motors 30 h.p., while the motive power required for the lateral travel is 22, 45 and 112 h.p. respectively. The capacity of the three classes respectively is 6x120 tons, 2x140 tons, and 2x160 tons per hour.

The electric fittings are constructed for polyphase current at 500 volts and 50

*Mining and metallurgical engineer, Ekaterinburg, Russia.

Coal, Iron and Timber Resources

In the past, the Ural district has produced iron, copper, gold and platinum in paying quantities. Coal of good quality is not produced, the only known coal beds producing a semi-anthracite of rather high ash but quite satisfactory for steam raising; certain parts of the field produce a coal from which a very poor quality of coke can be made. Good coke must be brought from South Russia, and costs in Ekaterinburg about $10 gold per long ton. The forest area is very large and covered mostly with pine and birch from which good charcoal can be made; and with proper attention to forestry, the supply will be practically inexhaustible. There are also very large areas of peat of good quality, and in many places this is cheaper fuel for steam generation than wood or coal.

In many places, there are large deposits of very high-grade iron ores, a yield of 60 per cent. Fe being common. A year's average at Nijni Tagil of all ores sent to the furnace was 63 per cent. Fe, and the phosphorus content is low. A most excellent charcoal iron may be cheaply made. The whole district is dotted with small charcoal furnaces (many of them having valuable water-power rights) which have not kept pace with modern progress until now the more modern plants in South Russia and even in Poland can undersell them in their home market.

Copper Operations

Copper ores, both sulphide and oxide, are widely distributed, but have been handled in the crudest manner in plants which should have been discarded long ago. Even with these unfavorable conditions they have been profitable except in cases where their management has been very bad. It is only within the last two years that any steps have been taken toward working along modern lines.

Precious Metal Mining

Gold is obtained from both placers and veins, but in both cases the plants provided have been badly arranged and badly worked. Systematic exploration and operation are unknown and no advantage has been taken of improvements made in other parts of the world. The platinum placers are too well known to call for comment. This metal has been found in place in the Tagil district, but it is not known whether or not the rock can be profitably handled. As much of the country is covered with soil and forest, and outcrops are few, prospecting is somewhat slow and expensive.

Labor Conditions

Labor is cheap but not efficient, and while plentiful in winter is rather scarce and inclined to be independent and lazy in summer. Skilled labor, carpenters, masons, etc., is of good quality if given proper supervision, especially where work can be done by contract. In the old concessions, one of the conditions was that employment must be furnished all the time to a certain number of workmen. As the profits began to decrease it became difficult to fulfil this condition, and the companies resorted to decreased wages, shortened hours of labor, and encouraged the workmen to remain idle on all holidays, of which there are about 135 in the year. They kept in view only the necessity of employing numbers, regardless of the amount of work done by each man. This inevitably tended to greatly lower the standard of labor and to diminish still further the possibility of profitable operation. Now, the average workman shows a distinct disinclination to do a fair day's work, and unfortunately this is not limited to the lower classes of labor. The government has, however, seen the effect of this clause of the concession and has now allotted land to the men in lieu of the right to have work at all times. Although labor is not of the best, I have found it tractable and easily managed, and capable of being slowly developed to good efficiency if properly handled.

Our cost at Blagodatny mines of $2.50 to $2.75 per short ton, exclusive of office and general expenses, for smelting copper sulphide ores in shaft furnaces in a small plant of 2000 tons monthly capacity, not designed for labor economy, will compare favorably with similar operations on the same scale elsewhere.

Difficulties Met

The great difficulty in learning the Russian language and the unfamiliarity of foreign engineers with Russian conditions, together with the almost impossibility of selecting satisfactory and trustworthy men for minor executive positions from among the Russians are serious drawbacks for foreign companies and necessitate careful consideration by intending operators in this field. The failure of some of the British owned companies may be traced directly to this cause, although some of them have possibly been the victims of not overscrupulous promoters in Russia.

Foreign companies must also contend with a great inclination to steal on the part of the workmen. The Russian workmen argue that gold is made by God and not by man and that it is not wrong to steal it. And he seems to apply the same line of reasoning to anything else which can be converted into gold. The greatest care is necessary to prevent excessive losses in this direction.

The Russian owners of concessions have in most cases given no personal attention to the properties, taking only the profits and allowing nothing for plant improvement. The local agents in whose hands they left matters have proven in nearly every case entirely incompetent to direct the working of the properties, and have allowed a very low standard of efficiency to develop among all classes of employees.

Opportunities in the Ural

The Ural is not a place for small operators, but for strong companies with suitable professional and financial equipment, there are good opportunities for profitable investment of capital, and present indications point to the absolute necessity of securing this capital outside of Russia. The Russian owners must, however, realize that their present equipment is in most cases worthless, and that it will be impossible to capitalize their past profits as a basis for present negotiations. Throughout Siberia the conditions which hold good for Ural are true, although the country is almost entirely undeveloped.

The mining laws are somewhat paternal in character and if strictly enforced would be a serious bar to all operations. The officials seem, however, to be quite fair in their interpretation and I think that the editorial remark that the government is hostile to foreign enterprise is not at present justified. In fact practically all the successful companies in Ural today are foreign owned.

Vice-Consul-General Charles B. Perry, of Calcutta, reports that while manganese is one of the advancing industries of India, the trade has received a setback, the quantity exported falling from 42,570 tons in the fiscal year 1907-8 to 24,968 tons in 1908-9, while the value declined from $254,329 to $156,763. These results are believed to be due to a revival of the Russian manganese industry, which had received a severe check owing to the troubles in that country. The exports to the United Kingdom in 1908-9 were less than one-half those of the preceding year, those to Holland ceased altogether, while those to France decreased considerably; those to Belgium, however, increased. The United States took only a small quantity of the ore, but even then it was an increase on that taken in 1907-8.

According to the *Iron Age*, the largest day's production of pig iron on record was made by Duquesne Furnace No. 1, which turned out 832 gross tons of bessemer iron on March 30, 1906. On the same day the four Duquesne furnaces produced 2882 tons of iron. The best week's record was made by these four furnaces March 24 to 30, 1906—a total of 18,028 tons. The best month's record for the four Duquesne furnaces was that for March, 1906, when the total output was 78,119 tons. It will thus be seen that in the best day's record for the group the average per furnace was 720½ tons; in the best week's record the daily average per furnace was 644 tons, and in the best month's record the daily average was 630 tons per furnace.

Paralysis of Mining by the Holding of Idle Claims

To Stimulate Actual Digging or Abandonment of Claims, a Direct Tax of $100 per Claim Is Proposed in Place of Annual Assessment Work

BY EDMUND B. KIRBY*

The young man who for the first time follows a mining rush to the point of some new discovery sees an interesting and, to him, a strange phenomenon. Men by dozens, then hundreds, then thousands, are hurrying to the spot, followed by supplies of every kind. Ore is accumulating on dumps, or moving out on road or trail. Around the lucky discovery, as a center, is a busy scene, the ever widening area of active claims, the driving of shafts and tunnels into the ground searching for ore. Beyond them are the miles of claims staked by the late-comers.

As each new point of discovery is announced, an outlying camp springs into existence. Buildings and towns appear, as if by magic. At the focal point men swarm, and money pours in from every part of the country. Trading progresses night and day; the important feature of the boom camp is the buying and selling of claims; the capitalization of hopes and chances into stock issues and the sale of these to an excited country which uses them as chips in the great game of the stock exchanges. Fortunes are made on every hand; a few out of ore, but the majority out of other people. The game is wild, boldly played, and with big stakes.

If the young man returns a few years later he finds the scene has changed to an industrial one. The few fortunate mines are digging, shipping, milling, smelting. Their employees and the merchants who supply their wants are prosperous, but with pay-roll prosperity. All others have disappeared. The day of fortunes has gone. Around the industrial center is a scene of desolation and waste. Digging there has ceased and the surrounding hills have become a cemetery. In every direction appear decaying headframes and mine buildings and the scars of innumerable excavations, each one marking the grave of some buried hope. The swarming town has shrunk to a factory village. In the outlying sections is the silence of industrial death. The years roll on and as the discovered ore becomes exhausted, one by one the great mines stop, and the desert, calmly waiting, resumes its ancient away.

And, after the man has seen other booms, and has learned of mining in other lands, and other times, he awakens at last to the fact that the life process he has been noting is the same for every district, differing only in its length, or in details, these depending upon the country and the character of the discoveries. But, what is the reason for such a peculiar process? What is it that so quickly stops exploration work? What is that strange paralysis which appears so promptly at the extremities of the district, and presses so steadily and resistlessly toward its center? To such questions, the inquirer receives from mining men the ready answers: "Perfectly natural." "Necessary reaction." "No ore." "Dug out." "Game over." "Everybody gone home."

But, suppose he has a brain that thinks, that is not put to sleep by ready-made answers, but wants to know: Why is paralysis natural? Why did the digging for ore stop so suddenly and simultaneously, and why does it stay stopped? Was all the ore in this great area discovered in that brief spurt? Were those holes the intelligent work of experienced miners, or the reckless attempts of ignorant speculators? Is the camp really dug out? Why did everybody have to go home? Are such questions any more foolish than those of the men who first asked: Is smallpox natural? Is diphtheria necessary?

Idle Claims

Investigate the paralyzed area and on nearly every claim we find that the owner, whether an individual or a corporation, has practically finished all the digging he is ever going to do there. His money has run out, or the chances on that claim are too poor, in his judgment to warrant the risk of more; or, he has never intended to do any more than the 10-ft. discovery hole and the pretense of annual assessment work necessary to hold the claim, awaiting the developments of the country, the improvement of transportation and methods of treatment, etc. The vast majority throughout the West and Alaska are of the latter class. Not 1 per cent. of idle-claim owners seriously intend to dig and are making active efforts to raise money for that purpose. All are waiting. Much of the dead area is owned by defunct mining companies. Their stocks are scattered over the country; their officers have vanished and any attempt to do business with one of these concerns is a task the difficulties of which can be appreciated only by those who have tried it.

Examine the work done on each claim and we find that in the great majority referred to, the trifling discovery and assessment work has been merely perfunctory, and has furnished little or no evidence as to the mineral chances of the ground. These are still unknown; as good or as bad as they were before. In the cases where some real digging has been done, it is often found misplaced, or so unwisely executed that it has not settled the question at issue. Hence, most of the area tied up is still untested; still capable of discoveries, great and small. It still needs the work of the prospector and the miner, but has been permanently locked up out of their reach.

Extent of the Paralysis

Analyze all the varied plans and motives of these idle-claim owners, and we find that most of them are waiting either in the hope of profiting in some way by the work of other men, or, with the expectation that in the distant future, investors will pay prices which they now decline. The deadlock thus produced is the deadly paralysis which curses the mining industry today. There is nothing to break it; nothing to force action. There are no expenses. The assessment work of $100 annually on unpatented claims is usually faked, and the taxes are nothing, or so trifling as to be merely nominal.

Owners can wait forever, and they do so, generation after generation, hoping that some time, in some way, the worn title deeds, or faded stock certificates, will enable them to extract a fortune from other men. And so, a great industry languishes, while paralysis, partial or complete, blights every district from the Mexican line to the frontiers of Alaska. And prospectors have nowhere to go, and miners lack work, while investors and the representatives of mining capital are searching this and other countries for opportunities to mine.

That the mining industry can move at all under this handicap is proof of its wonderful vitality. This is always struggling, ever breaking through the spell into new life here and there. Nature is prodigal, and the desire to mine is strong. Men still pay the price and take a chance. Some camps are so rich that development discoveries have slowly grown and extended for many years, bringing to life again, for greater or less periods, large portions of the dead margin. In others, the great mines have lasted for generations.

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*Mining engineer, St. Louis, Mo.

NOTE—Address delivered at the meeting of the American Mining Congress, at Goldfield, Nev., Sept. 27 to Oct. 2, 1909.

Sometimes new discoveries or improvements in methods of mining and reduction have brought dead tracts to life again. But, over the greater part of the vast mineral area, paralysis reigns supreme. The industrial life appearing and reappearing here and there is, at best, only a mere indication of its latent possibilities; of what the mining industry might be if the disease which now represses it were eradicated. Dug out? Why, mining in this country has only just begun!

Idle-claim owners, whether large or small, are doing only what any other men would do in their places. They are operating within the rules of the game. So are the bacilli of tuberculosis or of typhoid. But, the disease which such ownership produces in the industrial system has always been more or less evident to the perceptions of all men. The common sense of miners has always declared that rights to mineral, like rights to water, should exist only with use. To hold them otherwise is an injury to all.

In the freest and finest expression of that common sense, the old district mining laws of the West, made and enforced by the working miners, two intentions always appear: (1) To prevent monopoly and give everyone a chance; (2) to force every claim owner to dig or to get off so that others may dig. The principle of the latter requirement still appears in the present United States law in its provisions for annual development work, the continuous operation of tunnels, etc.

Intention of the Law

The history of mining law shows that men have always maintained a difference between the right to mineral and that to other forms of land. It was clearly seen that mineral is valuable only when discovered and mined, and that it is injurious to the State to permit such private ownership as will hold it out of use.

For centuries past mining laws have been saying that no man has the right to hold mineral land idle; that he must dig, or allow others to dig. The application of this principle was effective in small frontier camps where the miners who made the law stood on the ground to enforce it, but as it passed into general law covering vast areas and became dependent upon the cumbersome machinery of government for enforcement, it was found impossible to compel the continuous operation desired. Some codes were more effective than others, but even the old Mexican law, the finest product of accumulated experience, was only partially successful in this matter.

The reason for this strange fact is a simple one. It seems easy to frame a law which will order a man, under penalty, to dig continuously, but as a matter of fact this is so difficult that it never has and never can be accomplished. How much digging, how shall it be measured and by whom? In what place and at what rate? How about delays from misfortune, delays to supplies? What single rule will fit the poor prospector and also the rich corporation? Who is to stand over half a million claims and see that the work is done? At whose say shall a man lose his property? By the time all these points have been provided for, they have so weakened the law as to make it ineffective, and all that it is capable of doing is to retard, more or less, the progress of paralysis.

As another remedy, a penalty tax upon idle claims has often been proposed, but when the attempt is made to define the difference between idle and working claims, all the difficulties aforesaid at once appear, and it is evident that this plan has no possibility of success.

The New Remedy

However, the world is progressing not only in electricity and aëronautics, but also in other branches of knowledge, and a new light has been thrown upon the problem which has so baffled past generations. It has been discovered that the way to force the use of any natural resource is to tax it, not lightly in the ordinary way, but heavily enough to make it uncomfortably expensive to hold without using. The holder is then impelled either to let go, or to utilize it in some way. Here, at last, is a new way to solve this old problem; a way to accomplish perfectly what the mining world has always been wanting and trying to do. It is the way to end promptly and forever the paralysis of mining districts. The old method was to give men orders which could not be enforced. The new method gives no orders. It lets every man do as he wills, but it applies to each man a new and subtle force, continuous, persistent, non-evadable, the force of his own pocketbook making him now want to dig, or get off the claim.

But the question may be raised, how can it help an industry to tax it? The answer is that the industry, the digging out of the mineral, is not taxed. Every man is made to pay for occupancy; for holding a reservation of mineral ground away from other people who want it. Such a payment, when made just large enough to be uncomfortable, or painful, on an idle claim, would be only a small item in the expense list of an operating claim, for it takes money to mine. Such an item would never stop nor discourage digging. In producing mines, it would be far less than the royalties now paid everywhere by miners to idle-claim owners. When a man has to pay for the privilege, he will not hold more ground than he intends to work. When the privilege of holding is free, he will naturally grab everything in sight and wait in order to hold up someone else who may want to use it. Let the dog in the manger pay for his manger.

Strange as it may seem at first sight, the way to boom an industry is to tax the natural resources it uses. The way to discourage it, is to tax anything else it uses, or to tax its products. This scientific principle of modern taxation is now as firmly established as any law of chemistry or physics, and is slowly but steadily forcing its way into the tax systems of civilized countries. If you want to encourage the utilization of water power, tax water falls so heavily that no one can hold one idle, or away from would-be users, and only actual users can pay the tax. To discourage use, tax the buildings, machinery, supplies, or income.

The best and the scientific method of applying the tax to claims would be by assessment according to their actual value. But any method will work, so long as it is carried far enough to produce the effect It will, of course, be necessary to prevent tax dodging. Any state, or any county, may apply the remedy at will, for even if there are limits to the tax levy it may impose, there are none to its powers of assessment. It can apply the pressure and steadily increase it, watching the effect, until this has reached the point desired.

As a starter, which will serve to give partial relief, promptly and generally, a certain improvement may be made in the United States assessment law. This is to change the present requirement of $100 worth of assessment work yearly on unpatented claims into a cash payment of $100. The object of this change would be to make a weak law more effective by converting it into a taxation scheme. At present, it is better than nothing, but still a failure, for the simple reason that there is no way to stand over hundreds of thousands of claim owners and see that each one does his work and that it is really worth $100, and so this provision is evaded in various ways. The payment in cash, however, would be clear and definite, and much harder to evade.

Dodging may be prevented entirely by suitable provision in the law. This amount acting as a tax and made non-evadable would set free for the prospector at least one-third of the claims now held in the United States and Alaska. The remaining work would have to be done by state and county taxation, and by Congress for Alaska. The present assessment law is all that is left of past efforts to make men dig or get off the claim, and it should not be altered, except for the deliberate purpose of converting it into a more effective instrument. It may be added that an incidental advantage of the improvement suggested is that the record of payments made will do away with many of the present title uncertainties now due to pretended assessment work.

Relief to Prospectors

It will be argued that a tax of $100, to say nothing of additional state and county taxes, would ruin the prospector. As a matter of fact, it will have exactly the opposite effect and nothing can be more to his benefit than measures which tend to check monopoly and force every one to dig. Suppose he has to let go of his single claim; what has he made out of it? It has never yielded him anything but dreams. Are not hundreds of thousands of claims just as good, or better, now thrown open to him to prospect, or to hold when he pleases? It is simple arithmetic. Lose one and gain a hundred thousand, which is the better? Will not the surface of the earth once more be open to him to prospect as in the old days?

Today, the land is shut off, staked and monumented far as the eye can see. He is like the Indian and the cowpuncher. His business is gone. The judgment and skill in finding ore deposits, gained by years of experience, are now useless. A few young and less experienced men may reach the unstaked frontier in Alaska, but he cannot. He asks despairingly, where can I go? What can I do? So, he settles down upon some fourth-class chance, which the crowd of claim stakers have passed by or abandoned, and hangs grimly on to his last hope.

Let us look squarely at the facts. A very small percentage of the idle mineral claims is owned by prospectors. The overwhelming bulk is held by mining companies, or by individual investors, who have shut off the prospector and destroyed his business. In most cases, the few claims he is supposed to own are in reality only partly his. The investors who furnish his grubstake own a half or three-quarter interest and the tax money would, like other expenses, come from them. The prospector is virtually only their watchman or caretaker. The fact is that the prospector himself is not a success at the game of idle claims, and rarely makes it pay. His real business is not claim staking, or watching stakes, but the discovery of ore deposits. Give him back his regular business, and his chances of making a fortune will be multiplied a hundred fold. The prospector does not have to be mollycoddled. He can stand any laws which are necessary for his own and the general good, and can raise tax money, when wanted, in the same way that he now raises his expense money.

Mining investors are always eager for opportunities and every prospector who makes a real discovery, worth holding, is promptly beset by men who crowd their money upon him. If the claim is not valuable enough to interest others, he will not hold it, and so will pay no tax. If it is desired to force large companies with areas of two, four or ten square miles of valuable mineral land to dig or get off the claim, the prospector must do likewise. A far more profitable business awaits him and with the flood of prosperity which will follow more digging and free mineral land, he will never want a job or a grubstake, or financial backers and purchasers for his discoveries. Abolish the "claim-staker" and give the real prospector a chance once more, and you will hear of new discoveries from every quarter.

The question may present itself whether a tax of $100 per claim, while applying the necessary pressure to ordinary claim holders, will not be too small to be felt by mining companies. This would be true in many cases, but this tax is only suggested as a convenient and universal starter. The further pressure needed in such cases must be applied by state and county taxation. As a matter of fact, however, nothing is more sensitive than the pocket of a corporation, particularly if that corporation is idle, or the pocket empty. Even the tax of $100 will have a wonderful effect in causing mining companies to trim their edges, and further pressure may be made to squeeze their holdings down to actual working needs.

Claim Holders and Investors

Another question which will be raised is whether the taxation of mining claims would not interfere with property rights; destroy the value of investments; scare away investors, etc. What rights? The right to hold a claim without using it? Do you not want to discourage that? Has not the mining world for centuries forbidden it and tried in every way it knew to prevent it? Investments in what? In idleness? In a hold-up of industry? Will this scare those who want to dig; to do real mining; to build mills, smelteries, railways, towns? On the contrary, you will draw them in swarms because when holders have to dig or get off the claim all who have claims worth mining will make their offers for working capital attractive enough to get it.

What first excites and draws investors into mining ventures, is the chance to find ore by actual digging. This is what they ask for. It is the chance of discovery and not the acreage of a property which brings their money. At first they are not, as a rule, interested in the other game of waiting to hold up some future producer, and, in fact, do not even think of this unless fortune turns against them and work comes to a standstill. Then they naturally want all the chances for salvage that the rules permit and paralysis ensues. Is it not right to say to these men: "You have had a miner's chance. Sorry your money is lost, but it is gone and there is no reason why you should take it out of some other man's pocket; these claims are worthless until ore is discovered and mined. The State wants this done and will not let you paralyze its mining industry. If you are through digging, get off, so that someone else may dig." That is what the common sense of miners has always said. It is what the mining laws of the world have always said, but with a feeble voice. Is it not time to say it now with a loud voice and make it go? "Dig, or get off the claim!"

Even idle holders themselves see that they have brought on a deadlock which is not to their own advantage. Very few really make any money at it. Men grow old and sink into the grave, still dreaming of the purchaser who never comes. In the great majority of cases, all that holders will really lose by the proposed change in the rules, are their visions, their hallucinations. In exchange for these, there will be the countless opportunities of a rejuvenated industry.

Is it not clear as day that by the pressure of increasing taxation, every claim may be forced into use or release? When from Mexico to Alaska every claim is either working, or open to prospectors, does it take a prophet to see the result? Does not every prospector know of areas he would like to explore? Does not every miner, every operator, know of places where he would like to dig? After the real mining industry begins, cannot everyone foresee in its general, steady and permanent prosperity, a better living and more chances for a fortune than are possible under the present paralysis? Men of the mining world, the new era awaits your call. You have but to say the magic words: "Dig, or get off the claim!"

Copper Production in Russia in 1909

The production of copper in Russia in the first six months of 1909 was 8290 metric tons against 8319 tons in the first half of 1908. This quantity was made up as follows: Urals 3908 against 4378; Caucasus, 2880 against 2464; Altai and Siberia, 1095 against 1172; and in the chemical works and refineries 407 against 305 tons. The falling off in the Urals and Siberia was due largely to changes in the Demidoff group.

According to the superintendent's report for the year ended May 31, 1909, the Alaska Treadwell Gold Mining Company sent 768,628 tons of ore, of an average value of $2.575 per ton, to the mills during the year. Mining cost $1.1361 per ton, milling $0.1816, and general $0.2236; total operating costs $1.5431: Construction and repair costs amounted to $0.0439 per ton bringing the total operating and construction cost per ton to $1.5852.

Iron Mining at Coleraine, Minnesota

By Albert H. Fay

The town of Coleraine is the terminus of the Duluth, Missabe & Northern Railway, at the western end of the Mesabi range in Itasca county, Minn. The railroad was completed to this point in July, 1906, when active development work began. All work in this district is being done by the Oliver Iron Mining Company, and it has been planned on a large scale, for the future as well as the present. The village is on ground that has no iron under it and all the buildings are substantially built. A $90,000 school house has been completed and plans are out for a $40,000 town hall. The streets were paved and a complete water, light and sewer system was installed by the mining company before the town was incorporated last April.

The district has a population of about 4000 people, 1000 of whom are employed by the mining company. The townsite was laid off in lots, 75x100 ft., with wide streets. A large number of houses have been built by the company and rented to the employees at a reasonable price. There is also a scheme whereby those so desiring may make monthly payments on the house, in place of rent, and in five years' time will receive a deed to the house and lot at a price which merely covers the cost of the house and lot. When the company sells lots, there are certain restrictions in the deed designating whether the lot is to be used as a place of business or for a dwelling house.

There is also a clause which prevents the sale of liquor on the lot without a special agreement with the company. In this agreement there is a clause in which the owner of the saloon must pay a commission to the bartender on the sale of soft drinks. There are only two saloons in the village and gambling is prohibited. Under this system the company can control the number of saloons in the place and prevent them from becoming such a nuisance as they are in many of the mining camps. In fact the town is built very much like Gary, Ind., though not on so large a scale.

Mining Operations

The principal mining operation is that of the Canisteo mine, one-half mile north of the village. There is a large deposit of iron ore covered with 60 ft. of glacial drift, 4 to 8 ft. of shale containing fossils and 8 to 10 ft. of taconite. Seven 2½-yd. steam shovels have been at work for the last year and a half stripping this ground. The best record for any one shovel in this district for 10 hours is 2600 cu.yd. Twelve locomotives are employed in disposing of the waste material, all of which is taken out nearly two miles before it is dumped. Along the line of the conservation of our mineral resources it might be mentioned that the taconite, which is a low-grade iron ore, is being stored by itself so that it may be used in the future, should there be a demand for ore of this character.

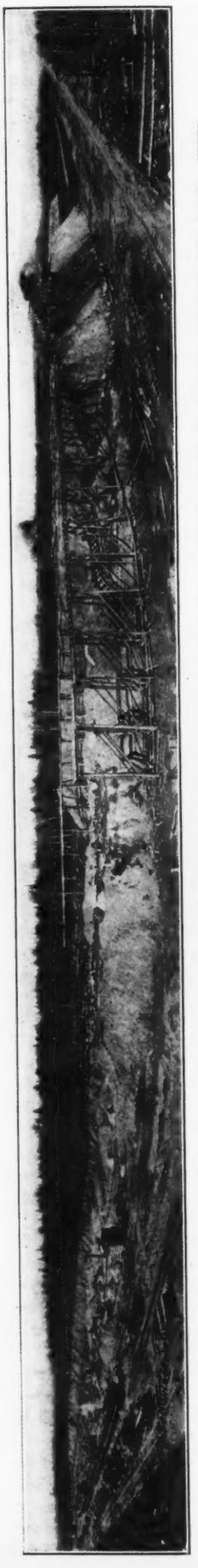
A central pumping station has been installed and by means of a drift underneath the orebody and a raise to the bottom of the pit, all of the water is easily taken care of. The same system of handling the water is being carried out at Marble where the company is opening a pit by steam-shovel work. This pit is over one mile long and several hundred yards wide. The first train load of ore was shipped from the Canisteo mine, July 29, 1909. At Taconite, mining operations are also conducted on a large scale; the first load of ore was shipped from the Holman mine on May 17, 1909. These three mines are within a space of about two by three miles and are operated from the main office at Coleraine under the management of J. C. Greenway. The district promises to be a large producer and much money has been spent in preliminary work. Some of the ore contains a large percentage of sand, thus reducing its iron content. This necessitates the installation of a washing plant. However, a large portion of the ore will be shipped to market as it comes from the mine. The low-grade ore from the three mines will go to the same mill.

Milling Equipment

A small experimental mill has been in operation for several months. The mill has a capacity of about 40 or 50 tons per hour, and is equipped with one conical trommel, picking belt, double log washer, one Oliver turbo and one Overstrom table. The work of this experimental plant has been so satisfactory that a large mill is now being constructed.

The new mill will cover a ground area of 160x255 ft. It is a steel structure sheeted with 2-in. tongue and grooved plank and this covered with corrugated iron. It will contain five units which may be increased indefinitely. Each unit will have one 2-in. mesh, conical revolving trommel, 48 and 84 in. by 14 ft.; two double log washers, 25 ft. long; one picking belt; two settlers; two Oliver turbos and 20 tables of the Overstrom or Wilfley type.

A steel trestle has just been completed as an approach to the mill. The distance from the top of rail on the receiving bins to the top of the rail beneath the bins for the finished product is 90 ft. The ore will be handled by gravity all through the mill. A dirt embankment, from 90 to 100 ft. high, about 3000 ft. long, and wide enough for double tracks, forms the approach to the steel trestle at the end of the mill. This is shown in the illustration, just back of the trestlework. The receiving bins have a capacity of 250 tons per unit. A pressure tank, 120 ft. high, will hold 100,000 gal. of water for milling purposes.



EXCAVATION FOR WASHING PLANT. CONCRETE FOUNDATIONS FOR MILL AT LEFT. FIRST SECTION OF 90-FOOT FILL AT RIGHT, SHOWING TRESTLE ABOUT 35 FEET HIGH. STEEL STRUCTURE BEGINS NEAR WHERE CABIN IS SHOWN. TAKEN MAY 15, 1909

The water is supplied by a 30-in. main from a pumping station on Trout lake. The intake is 48 in. in diameter, and extends into the lake 450 ft., making the total length of the pipe from the intake to the mill 6000 ft. Prescott pumps of the Mesaba type are used and have a capacity of 8,000,000 gal. per 24 hours. The mill is supplied with power from a steam plant of 1500-h.p. capacity. All the machinery in the mill will be operated by electricity.

Flow Sheet of Mill

The ore from the mine is brought to the mill in 50-ton, bottom-dump, steel cars on an up-grade of 1.75 to 2 per cent., and dumped into the receiving bins. From here it passes through the trommel, from which the oversize goes to a picking belt yielding two products, heads and tails. The undersize from the trommel passes into a settling tank where the surplus of slimes is drawn off and the ore passes from the bottom of the tank to the log washer. Instead of the regular type of washer with end water feed, the water is fed through the bottom of the first 6 ft. of the trough, which is inclined 1 in. per foot.

CONCRETE FOUNDATION FOR MILL; 90-FOOT STEEL TRESTLE APPROACH. AUG. 1, 1909

EXCAVATION FOR MILL FOUNDATION. BASE OF 90-FOOT FILL IN BACKGROUND. APRIL 15, 1909

The heads from the log washer go direct to the shipping bin. The tailings go to a settling tank and from this pass into the Oliver turbo. This turbo is built in 12 sections, each of which is 18 in. long and so arranged that the flow of water can be varied to suit the condition of the ore. The feed water enters through the bottom from each section. The turbo is similar to a double log washer, but turns much slower. Its principal difference is in the method of applying the feed water. The turbo is inclined 1 in. per foot. By varying the feed water the heads leave the turbo quite dry. This is one of the principal advantages of this machine.

The heads from the turbo go direct to the shipping bins while the tailings are sent to the concentrating tables where two products are made. The heads from the tables go to the same bins as the finished products from the log washer and turbo; the tailings are sent out as waste. It is possible that later a middle product will be made from nine tables on each side of the unit, and this sent to the tenth table for further concentration.

There are four loading tracks and ore from any bin may be loaded on each track. The tail tracks have a down-grade to the mill so the cars may be pinched out without the use of an engine. The capacity of the new mill will be approximately 500 tons per hour, and will be ready for operation in April, 1910. This is the first washing plant to be installed in the Mesabi district, and it marks the beginning of a new era in the mining industry, as ores that were heretofore considered worthless will now be made to yield a fair percentage of profit. I am indebted to J. C. Greenway, general superintendent, and to M. Curley and Charles Claypool for many of the above data and for the many courtesies shown me while at Coleraine.

The Technical Application of Titanium*

Titanium so far has found only one application; namely, coloring porcelain, artificial teeth, leather and textiles. Almost ten years ago an English firm made the first attempt to utilize titanium compounds for coloring purposes.

H. W. Kearns and Doctor Barness applied on Dec. 5, 1896, for letters patent on titanium compounds, tannic compounds and similar compounds for coloring vegetable fibers (cotton, linen, jute, etc.) in raw or manufactured state during any stage of manufacture. Experiments made by Dr. Franz Erben[1] proved that a fiber treated with a tanning compound as a mordant and then subjected to the action of titanium ammonium oxalate furnishes a saturated golden yellow color of great durability withstanding the action of boiling and washing. This coloring is preferable to that produced by chlorinated primalin and even the best sulphur colorings on the market. Dr. C. Dreher[2] is less enthusiastic concerning this tannin-titanium yellow in application to leather. However, Doctor Erben claims a favorable experience during nine years.

By the addition of small quantities of auranein G or O, acid orange or similar products the shades of yellow or orange can be modified at will. The tannin-titanium base allows the improvements of many other colorings as for instance, red green, blue, etc.

Introduction of Titanium into Metallurgical Processes

The man who did most for the introduction of titanium into metallurgical processes is Dr. Auguste J. Rossi. In his contribution to the *Iron Age*, Feb. 6 and 20, 1896, he summarizes his conclusions concerning titaniferous iron ores as follows: (1) These ores have been certainly smelted in Sweden for years without any difficulty. (2) Their metallurgical treatment for a certain number of years in England by Doctor Forbes, in a large furnace, has proved a perfect success. (3) Furnaces were run for years in the Adirondacks with these ores with excellent results. (4) The metal they yield, either as pig metal, iron or steel, possesses special valuable qualities. (5) These ores, which are found in large masses in many States of the Union, are almost invariably "bessemer ores," and as such it is asserted have been used in Pennsylvania furnaces with great advantage. (6) When containing very large percentages of titanic acid (as much as 38 to 40 per cent. and even 48.60 per cent., like the ilmenite of Canada), and consequently a very small amount of iron (32 to 35 per cent. or less), their treatment though perfectly successful metallurgically speaking, has not proved economical as to fuel. However, it would be more proper indeed to call an ore like the St. Urbain ore (Canada), which contains 48.6 per cent. of titanic acid, corresponding to 29.1 per cent. titanium and

*Abstract of an article by Isador Ladoff in *Journ. Ind. and Eng. Chem.*, September, 1909.

[1]*Chem. Zeit.* No. 14, 1905.

[2]Faerber Zeit. 8, 255, 1902.

only 28.49 per cent. iron, a titanium ore than to call it an iron ore.

Doctor Forbes' treatment consists in adding to the titaniferous ores as fluxes, limestone and quartz or silica-bearing materials in such quantities to form, with the titanic acid, a compound reproducing approximately a natural mineral of titanium, known to be fusible at a moderate temperature (3 of scale of Dana), the sphene or titanite, a silico-titanate of lime, containing about 35 per cent. TiO_2, 25 to 33 per cent. lime and 28 to 35 per cent. silica. Doctor Rossi's method obviates the addition of silica, taxing the capacity of the furnace to excess. He introduces magnesia to a good amount into the slag by using a magnesia limestone, a dolomite. The alumina from the stone and ash of fuel and that generally present as principal basic constituent of these ores furnishes all the amount which is required to form the tribasic compound with the magnesia and lime of the stone and the titanic acid of the ore. In the same manner that magnesia introduced in certain proportions into an alumina lime silicate renders the latter more fluid and fusible, the addition of magnesia to a titano-silicate of lime and alumina considerably increases its fusibility and especially its fluidity.

Doctor Rossi ran in a very small furnace, with a blast at a temperature not over 250 or 300 deg. F. at the most, without any difficulty, slags of the following composition: SiO_2, 16.63; TiO_2, 34.66; CaO, 26.03; Al_2O_3, 7.26; MgO, 10.27; FeO, 7.12. Oxygen ratio 4.3 practically; actually 4.31. The ore smelted in that furnace contained only 1.5 to 2 per cent. silica or 20 per cent. titanic acid. The conclusions arrived at by Doctor Rossi are as follows: (1) Titanic acid can form definite compounds, perfectly fusible, if properly fluxed, containing as much as 35 to 50 per cent. of titanic acid, with alumina, lime and magnesia as bases, and admissible as slags, in blast-furnace work. Larger percentages still, such as 65 per cent., can enter into a compound, and it remains fusible. (2) In running a furnace under special conditions of temperature and pressure of blast, no troubles have been experienced from titanium deposits.

Smelting of Titaniferous Ores

That the smelting of titaniferous ores containing less than 20 per cent. titanic acid by means of an electric furnace is easier, than in an ordinary furnace, was proved by recent investigations, accounts of which were published in the technical literature.

Reference is here made to a case not yet published. In December, 1906, Prof. W. Borchers, of the Technische Hochschule at Aix-la-Chapelle, Germany, prepared a mixture of titaniferous iron sand of Java with lime and carbon, in proportions calculated to produce a scorification of the gangue during the reduction to iron. A resistance furnace was used and a direct current of about 500 amp., with a pressure of 50 to 60 volts, was applied. The fusion of the mineral proceeded with the greatest ease. At the expiration of 1½ hours after the operation was started the temperature of the fused mass in the furnace was found to be somewhat higher than 1900 deg. Centigrade.

After this operation the slag, which was quite fluid, was transferred to one crucible, while the metal was tapped into another crucible. A solid homogeneous ingot of metal weighing 1 kg., 620 grams, was obtained. The slag was black and had a vitreous fracture.

The analysis of the mineral was as follows: Silicon, 1.6 per cent.; aluminum, traces; protoxide of iron, 28.5 (Fe = 22.18); peroxide of iron, 49.95 (Fe = 34.97); oxide of manganese, 0.98; lime, 0.37; magnesia, 2.35; sulphuric acid, 0.69 (S = 0.027) phosphoric acid, 0.096 (P = 0.042); copper, 0.012; arsenic, 0.005; titanic acid, 16; loss on ignition, 0.068.

The analysis of the metal was as follows: Carbon, total, 3.05 per cent.; manganese, 1.52; sulphur, 0.01; phosphorus, 0.11; silicon, 0.37; iron, 94.94; total, 100.

There is, therefore, little doubt that titaniferous ores of less than 20 per cent. of titanic acid can be profitably smelted. All metallurgists agree that the qualities of the iron made from titaniferous ore and steel obtained from titanic pig metal are excellent. This fact gave Doctor Rossi the idea to use an alloy of iron and titanium made in the electric furnace as an improver of steel.

The addition of titanium to steel increases the transversal strength from 17 to 23 per cent. Bars 1 in. square, loaded at center, with 12 in. between supports, were used for transverse strength tests. For tensile tests round bars 1⅛ in. in diameter and from 18 to 24 in. long were used. The ferro-titanium added to the steel contained about 12 per cent. of titanium and from 6 to 8 per cent. carbon. About 1 lb. to every 100 lb. were added in small portions. There seems to be no advantage in using a ferro-titanium containing more than 25 per cent. titanium. Titanium also increases remarkably the elasticity of steel. The function of titanium in steel consists in its high affinity for oxygen and especially nitrogen.

At the Alaska Treadwell during the year ended May 31, 1909, the 300-stamp mill, operated by waterpower, lost 136 days 14 hours and 8 min.; 366,149 tons were crushed. The 240-mill, operated both by steam and water power, lost only 15 days 12 hours and 7 min. and crushed 402,479 tons of ore.

Graphite in Germany

Graphite consumed in Germany is obtained in Bavaria and Bohemia, although Siberia and Ceylon supply the best grades. According to the report of U. S. Consul-General Robert P. Skinner, of Hamburg, covering this subject, Germany also imports graphite from the United States, Japan, China, Australia, Mexico, Great Britain, Italy, Sweden, Belgium and France. The last returns available show that the importations at Hamburg for 1907 amounted to 5421 tons, $608,183, of which 583 tons, $104,765, were from the United States.

The graphite marketed in Germany is graded into: Select, 78.14 per cent.; prime, 67.3; seconds, 54.1, and better grades less commonly. The average prices per 100 kg. (220 lb.) run: Bohemian, washed and finely ground, $2.50; pieces, $2.85; Ceylon, finely ground, $4.28; carefully cleaned, $28.56, and acid-cleaned, $69. Retort graphite, obtained from pig iron and retorts in gas works, is quoted on the average at: $4.82 per 100 kg. in pieces; $16.85, granulated, and $21.64, prepared.

Montana Tonopah Mining Company

The annual report of this company submitted to the stockholders, Sept. 14, is as follows: During the year ending Aug. 31 1909, there was mined and milled 41,692 tons of ore, which gave a net profit of $127,963. The entire indebtedness incurred in the construction of the 40-stamp mill has been liquidated and the company begins the new fiscal year with $42,979 in cash. The report shows a total of 8015 ft. of underground work done during the year. The stockholders empowered the the board of directors to proceed with the plan of segregating the mine and mill and to consider the advisability of adding another 20 stamps and treating the product of another company. It is also predicted that the increase in capacity will decrease the cost of milling about one dollar per ton.

In Mexico it is customary to yoke the oxen by the head, the yoke being firmly bound to the horns by leather thongs. This method, which differs from the American U-yoke, is decried by Americans, but those who have tried American methods in the Mexican field find that the animals do better work under the Mexican yoke. It seems to be cumbersome and inhumane, but nevertheless it has back of it the usage of centuries, and probably is more effective than the American yoke, all things considered. The Mexicans are past masters in the art of ox and mule transportation, and they have little to learn from the Americans who come to Mexico.

The Utilization of Atmospheric Nitrogen

Birkeland & Eyde and Schönherr Produce Gas Containing 2-Per Cent. NO. 250,000 H. P. Utilized in the Norwegian Air-Saltpeter Plant

BY A. BERNTHSEN*

Of the two chief constituents of the atmosphere, we have hitherto been accustomed to look upon oxygen as the fundamentally important element. We are compelled to breathe it in order to support life; it is indispensable to almost every process of heating and combustion, and in the form of oxides, salts and the like it constitutes nearly one-half of the earth's crust. Nitrogen, on the other hand, we regard as a gas which will not support combustion, and it is generally characterized by a great disinclination to enter into chemical reaction. In spite of this, however, compounds of nitrogen play such an important part in the nutrition of all living organisms, that the task of finding out and opening up new sources of nitrogen compounds has become one of the most interesting and pressing problems of the day.

Methods of Fixing Atmospheric Nitrogen

The different methods employed in the fixation of atmospheric nitrogen can be divided into three groups: First, the direct formation of ammonia from its elements, nitrogen and hydrogen, both of which have to be isolated for the purpose; second, those processes in which the nitrogen is isolated, and then converted into metallic nitrides and cyanogen compounds, which, in their turn, can be subjected to chemical reaction, and lead to the production of ammonia; and, third, methods which aim at the direct oxidation of atmospheric nitrogen, and the conversion thereof into nitrates and the like. In this last case the air itself is used directly, and a previous isolation of the nitrogen is unnecessary.

It is not difficult nowadays to obtain nitrogen from the air; several methods can be employed on a large scale. One method consists in passing the air over red-hot copper, which retains the oxygen, forming copper oxide. This latter has to be reduced again by passing generator gas over it, and it is then able to absorb a fresh quantity of oxygen from the air. An alternative method consists in liquefying air according to Linde's process, and then separating the nitrogen from the oxygen by fractional distillation. Such processes, however, always increase the cost of the total operation. Hydrogen can also be obtained without great difficulty, since it results as a by-product, for instance, during the electrolysis of potassium and sodium chloride, but here again its cost depends upon the price which can be obtained for the other products of the electrolysis, namely, chlorine and the alkali.

Considering the direct combination of nitrogen and hydrogen, we are at once met by great difficulties, since, at the high temperature at which the combination takes place, the reverse reaction also sets in, and the ammonia formed is to a great extent decomposed back again into its elements. Consequently only a small fraction of the gases can be converted into ammonia, while the rest remains unchanged.

Second Group of Methods

The second group of methods of fixing atmospheric nitrogen depends on the property of nitrogen of combining with certain metals to form nitrides, or with metals and carbon to form cyanogen compounds, either simple or complicated. These nitrides and cyanogen compounds are then made to undergo a further chemical reaction, produce ammonia and metallic oxides and carbonic acid or other carbon derivatives. These methods consequently bring about an indirect synthesis of ammonia from its elements. The intermediate products formed during the reaction are sometimes of such importance that they are manufactured in this manner, without being finally worked up for ammonia. This is particularly true of the cyanides, especially potassium cyanide, which is used in great quantities in the extraction of gold from its ores.

Frank, in Berlin, and Nikodemus Caro, in Lodz, working in collaboration with Rothe, in Hamburg, noticed that when nitrogen was made to react with carbon and barium carbonate or with barium carbide, some barium cyanide was formed, but at the same time large quantities of another body were obtained, which differed from barium cyanide in containing a smaller proportion of carbon. This body is barium cyanamide. The matter was then taken up by the Cyanid-Gesellschaft, which was formed for this purpose by Siemens & Halske, the Deutsche Gold- und Silber-Scheide-Anstalt and Dr. Frank. Pfleger had suggested that the barium carbide be replaced by calcium carbide, which can be so easily obtained by heating lime and charcoal in an electric furnace. On carrying out this suggestion, a raw product was obtained that contained no calcium cyanide at all, but consisted chiefly of calcium cyanamide, mixed with graphitic carbon; it contained lime and carbon as impurities, was black in appearance and had an unpleasant odor, but the chief point was that it contained 20 per cent. of fixed nitrogen. The preliminary production of calcium carbide was subsequently found to be unnecessary, a mixture of lime and carbon being substituted. The product is now generally known by the name "Kalkstickstoff" or nitrolime. A similar product, "Stickstoffkalk," was obtained by Polszenius by carrying out the process in the presence of small quantities of calcium chloride, which had the effect of causing the reaction to take place at a lower temperature. Certain other salts possess a similar influence.

The cyanamides, on being treated with superheated steam, are split up with the formation of ammonia, and so this constitutes another process for the indirect synthesis of this compound. Kalkstickstoff or nitrolime has other uses. After being applied to the ground as a manure it is acted upon by bacteria and the like, giving rise to ammonia, and consequently must be applied to the soil before the seed is sown. According to published researches it can only be used on heavy absorbent soils. It also produces different effects on the various classes of plants, and Wagner has come to the conclusion that the farmer should not pay for the nitrogen contained therein, more than 80 per cent. of the price paid for an equal weight of nitrogen in the shape of Chile saltpeter, or in the saltpeter obtained from the air.

Great hopes have been laid on the further development of these processes, and an industrious agitation has led to quite a number of companies being floated; most of the factories though are still in the state of construction. It is interesting to learn that at Piano d'Orta, at the first nitrolime factory erected, a plant has has already been put down for converting it into ammonium sulphate, instead of using it as manure, and, according to recent reports, other works are following this example.

Third Method of Combining Nitrogen

The third method of bringing nitrogen into a state of combination, suitable for use on a practical scale, consists of converting it by direct oxidation into oxides of nitrogen, which are then transformed into

*Director of the Badische Anilin- u. Soda-Fabrik, Ludwigshafen a/Rh.

Note—Abstract of an address delivered at the Seventh International Congress of Applied Chemistry, London, 1909, from *Journ. Ind. and Eng. Chem.*, p. 466, July, 1909.

nitric acid and nitrates. Although, as mentioned before, nitrogen shows little tendency to enter into chemical reaction, it can, under certain conditions, be made to combine with oxygen. The first compound formed is nitric oxide, NO, a colorless gas. On mixing it with oxygen or air, it assumes a yellowish red color, owing to the formation of a higher oxide of nitrogen, which is termed nitrogen tetroxide, or nitrogen peroxide, and which possesses a constitution corresponding to the formulas NO_2 or N_2O_4. This is then converted into nitric acid, or into some other form suitable for practical purposes.

The direct combination of nitrogen and oxygen is brought about by means of high temperature, but the degree of combination is limited by the fact that the same temperature which brings about the formation of nitric oxide also tends to decompose it back again into its components. Only at a temperature under 1200 deg. C. is nitric oxide stable against the action of heat, but, at this temperature the amount formed is exceedingly small. Even at 1500 deg. C., only 1/10 per cent. of the nitrogen in the air is converted into nitric oxide, and a very much higher temperature is necessary to bring about a reasonable degree of oxidation. Muthmann and Hofer, and especially Nernst and his pupils, have found that at a temperature of 2200 deg. C. the gases contain 1 per cent. of nitric oxide, at 2571 deg. C. they contain 2 per cent., at 2854 deg. C. they contain 3 per cent., and at 3327 deg. C. they contain 5 per cent. The equilibrium constant is given by the equation

$$K = \frac{C^2_{NO}}{C_{O_2}.C_{N_2}}.$$

From the figures just quoted, it is apparent that, in order to be able to work profitably, the air must be heated to as high a temperature as possible, and then cooled down again with the utmost rapidity, so that as little opportunity as possible is given, for the nitric oxide, formed at the high temperature, to decompose back again into its elements.

Function Performed by Electricity

It is generally accepted that electricity brings about the reaction by means of the high temperature produced, but on the other hand, it is possible that it exercises also a specific electrical action on the gases, for we know that nitric oxide is produced from its elements by the action of silent discharges, as well as by the action of spark discharges and electric arcs. All efforts in this field have been applied to the production of series of sparks of electric arcs, and during the last decade, an intense activity has been developed, both in the laboratory and also on the practical scale.

Bradley and Lovejoy Operation

One class of scientists started by assuming that in order to use up the electrical energy to the best advantage, it should be distributed over a large number of small sparks or arcs. Bradley and Lovejoy founded their process on this assumption, and the Atmospheric Products Company was floated toward the end of last century, with a capital of one million dollars, and carried out their process at Niagara, making use of power obtained from the falls. They employed iron cylinders about 4½ ft. high and 4 ft. in diameter. In the axis of each of these a steel shaft rotated, containing, mounted one above the other, 23 zones of electrode arms, each zone containing 6 arms, and each arm being provided with a platinum sparkling terminal. The wall of the iron cylinder formed the other electrode, and was provided with a similar number of platinum terminals or poles, situated opposite to the terminals of the rotatable electrode. When the shaft was put into motion, the electrode poles, attached to the ends of the arms, came within sparking distance of the poles on the cylinder, and sparks sprang across from one pole to the other. As the motion of the shaft continued, the electrode poles were separated from one another, and the arc was drawn out and finally snapped, only to be formed again as soon as the next pair of poles came within sparkling distance of each other. A direct current of 10,000 volts was employed and no fewer than 414,000 arcs or sparks were formed and extinguished every minute. Air was passed through the cylinder. According to Muthmann, the yield amounted to 430 kg. saltpeter per kilowatt-year, a small yield, which, coupled with the complexity of the apparatus as well as its initial expense and the expense of keeping it in order, sufficed to prevent the process being worked at a profit.

Birkeland and Eyde Process

The first practical success in this direction was obtained in 1903 by Prof. Kristian Birkeland in Christiania, who worked in collaboration with the Norwegian engineer, Samuel Eyde. It was already known that if an electric arc, fed with an alternating current, be made to burn between the poles of an ordinary magnet, or of an electromagnet which is excited by a direct current, the arc assumes the form of a disk. More correctly, the arc is blown into a half disk at every half period, but the impression on the eye is that of a quietly burning disk, like the sun. Birkeland and Eyde inclosed this in a flat iron-clad furnace of fireproof clay, and passed a strong current of air through it, and they thus obtained considerable yields of oxides of nitrogen.

Since their first experiments, the furnaces have gradually been increased in size, until those now used are so large that each of them is fed with 700 kw. at a tension of 5000 volts, and the disk of flame is over 2 yd. in diameter. Each furnaces uses up nearly 1000 h.p., that is, 100 times as much as those of the Atmospheric Products Company. The utilization of this large quantity of electricity in a single discharge constitutes the great difference between Birkeland and Eyde's process, and those of the earlier experimenters.

Method of Otto Schönherr

The great importance attaching to the possibility of fixation of atmospheric nitrogen had, several years before that time, been recognized in the Badische Anilin- u. Soda-Fabrik, and special attention was paid to this new problem. As the result, Otto Schönherr succeeded, in 1905, in discovering, and with the assistance of the engineer Hessberger, working out a process of producing an electric arc, and was thus enabled to solve the problem in a surprisingly simple manner, presenting considerable advantages over the method of Birkeland and Eyde. It is not a mere modification of their process, as has sometimes been falsely assumed, but differs fundamentally from it. Schönherr dispenses entirely with magnets and magnetic fields, and produces his arc inside an iron tube of comparatively small diameter, at the same time passing the air through the tube, and thus bringing it into contact with the arc.

The manner in which the arc is developed is in itself very peculiar and interesting. The iron tube, or arc tube, contains an insulated electrode at one end, and can itself serve as the second electrode. The arc, at its formation, springs from the insulated electrode to an adjacent part of the arc tube which is only a few millimeters away, but the air, which is passing through the tube, being preferably introduced with a tangential or rotary motion, immediately carries the end of the arc along the wall of the tube, so that it either enters the tube at a considerable distance from the electrode, or it ends on a special electrode placed for the purpose, say, at the other end of the arc tube. A column of flame is obtained, burning quietly in the axis of the tube, and surrounded by the air which is being passed through the tube. The arc emits an intense light, and is quite stable. The air passing through the tube comes into contact with the arc, becomes partially converted into nitric oxide, and is then rapidly cooled down by contact with the outside layers of air, and consequently a decomposition back again to nitrogen and oxygen is avoided. The cooling action is still further increased by surrounding the upper end of the arc tube with running water, after the manner of the Liebig condenser. The gases leaving the tube contain about 2 per cent. of nitric oxide, that is, from one and a half times to nearly twice as concentrated as the gases which Birkeland and Eyde produce.

The method of introducing the air can be subjected to many variations.

With the aid of Schönherr's invention, it is possible to send extraordinarily large quantities of electrical energy through a single tube. The experimental furnaces at Christiansand are fed with about 600 h.p. at 4200 volts, and although it appears possible to build furnaces which could consume 2000 h.p., those regularly used will probably be built for 1000 h.p. These furnaces require about 40,000 cu. ft. of air every hour, and the arcs produced are nearly 8 yd. long.

Construction of Schönherr Apparatus

In the furnace on the large scale, the air passes into the arc tube through a number of tangentially bored holes in the part of the tube surrounding the electrode, and over these holes is an iron ring or cylinder, which can be moved from the outside by means of a lever, so that any desired number of the holes can be closed, and the strength of the rotary motion of the air regulated; this in turn assists in regulating the length of the arc. The insulated electrode can be cooled by means of water or air, and it is also provided with a central hollow space through which passes an iron rod. The arc actually springs from this iron rod, and as it burns or volatilizes away, it can be pushed forward by a simple arrangement; the rate of burning, however, is very slow. An ignition lever, or other simple arrangement, is provided so that the arc can be started afresh, if necessary. The furnace itself is connected electrically to earth, so that any part of the apparatus, with the exception of the insulated electrode, can be handled with impunity. The gases which leave the arc tube pass down a channel lined with brick, and concentrically surrounding the inner parts of the furnace. They are thus made to give up a portion of their heat to the air which is entering the furnace, and which is subsequently passed through the arc tube, thereby raising it to a fairly high temperature. This apparatus is extremely simple and durable; ordinary iron tubes are employed; there are no movable parts and no expensive electromagnets, and the manufacture runs smoothly without interruptions.

Though in this process there is very little loss of electrical energy in producing the arc, yet only a few per cent. of the energy serve to bring about chemical reaction; the rest is converted into heat. This latter, however, is not by any means wasted; 30 per cent. of it is employed producing hot water, 40 per cent. heats the boilers, 10 per cent. has to be removed by cooling, and only 17 per cent. is lost by radiation. The evaporation of the calcium nitrate solutions obtained is carried out solely by the heat generated in the arc. Another process worked by Pauling and utilized near Innsbruck by the Salpetersäure-Industrie-Gesellschaft of Gelsenkirchen depends on the use of divergent electrodes. From the data given by the author the process is inferior to the Badische process.

Commercial Features of Process

After the nitrogen has been converted into nitric oxide, according to any of the processes referred to, the actual combustion of the nitrogen is completed, but on cooling the reaction gases, as soon as the temperature reaches a certain point lying at about 600 deg. C., the nitric oxide begins to combine with the excess of oxygen, forming nitrogen tetroxide. The oxidation does not go past this stage of its own accord.

The next task is to bring these oxides of nitrogen into a marketable state, that is, either into the form of nitric acid, nitrates, or nitrites; also nitrogen tetroxide as such will be capable of isolation.

Up to the present time both nitric acid and nitrites have been manufactured from saltpeter by chemical reaction, nitric acid being produced by heating saltpeter with concentrated sulphuric acid, while nitrites result on heating sodium nitrate with metallic lead, which extracts one atom of oxygen, and is itself converted into lead oxide. Both nitric acid and nitrites are consequently more expensive than saltpeter. Nitrogen in concentrated nitric acid is two and a half times, and that in nitrites is one and a half times as valuable as nitrate-nitrogen.

Acid Absorption Process

It would, therefore, be more profitable to make nitric acid and nitrites, provided the consumption of these compounds were sufficiently great; but since the demand is limited, the chief aim of every large factory is to convert the supply of nitrogen into the form of saltpeter, for which there is an unlimited market. Before the nitrogen tetroxide contained in the furnace gases, after they have been cooled, is capable of yielding nitric acid, it requires to be combined with a further atom of oxygen, and this combination is generally brought about by the action of water. The gases are passed through an absorption tower down which water is trickling, and during the reaction which takes place, two-thirds of the nitrogen is converted into nitric acid, while one-third is regenerated as nitric oxide, which combines again with the excess of oxygen present in the gases forming nitrogen tetroxide, and this goes through the same course of reactions again. This constitutes the so-called acid-absorption process. The absorbing liquid can be run down the tower several times, each time becoming richer in nitric acid, until a 40 per cent. acid is obtained. (This must be further concentrated before it is marketable.) On neutralizing this acid with soda, a concentrated solution of sodium nitrate is obtained, and can be evaporated until the solid salt crystallizes out. On a practical scale, however, ordinary limestone is employed instead of soda, and calcium nitrate is obtained. This is at least as valuable as sodium nitrate for manuring purposes, and is consequently isolated as such, and brought on the market under the name of Norwegian or air-saltpeter.

Other Conversion Methods

Nitrates can be obtained directly from the furnace gases, by employing sodium carbonate or milk of lime as the absorbing agent, and at the same time maintaining the temperature and other conditions, such that, during the absorption, the gases contain equal quantities of nitrogen tetroxide and unaltered nitric oxide. According to this process, the Badische Anilin- u. Soda-Fabrik manufacture, at Christiansand, the sodium nitrite they require in their dye factory at Ludwigshafen.

Finally, if the reaction gases be cooled down to a temperature considerably below zero, nitrogen tetroxide separates out as a liquid, or, if the temperature be sufficiently low, it can even be obtained in the solid state, like ice of snow. Should the gases contain moisture, more or less dilute nitric acid is produced, the quantity depending on the amount of water present.

A further method of working up the furnace gases consists in passing them over quicklime. Halvorsen carried out this process at ordinary temperature, while Schloesing obtained better results by working at a raised temperature. The latter employs briquets of quicklime, prepared by molding slacked lime into the required shape, and then reheating it, and he places these briquets in iron vessels, and heats them on the counter-current principle, by means of the furnace gases, to from 300 to 350 deg. The final product of absorption contains dry calcium nitrate in admixture with free lime, and some calcium nitrate.

The absorption at Notodden is at present carried out according to the acid process; the first product is dilute nitric acid, which is subsequently converted into calcium nitrate. In order to recover the oxides of nitrogen which remain unabsorbed, the gases are finally treated with milk of lime or soda, and give rise either to a mixture of nitrate and nitrate, or to pure nitrite. More recent experiments at the Badische Anilin- u. Soda-Fabrik have shown the possibility of effecting the absorption directly with milk of lime, and, in this case, the acid absorption would be dispensed with and the initial outlay on plant greatly reduced.

Utility of Product

The calcium nitrate, obtained by means of the operations described, can, without further treatment, replace Chile saltpeter for the purposes of agriculture. Even a certain quantity of free lime, say 20 per

cent., appears to have no deleterious action on vegetable life, and the same remark applies to any calcium nitrite mixed with the nitrate. It is conceivable that calcium nitrite will become the artificial manure of the future, especially as its manufacture is so simple, and it is richer in nitrogen than calcium nitrate (it contains 21.2 per cent. of nitrogen). It possesses the further advantage of being less hygroscopic than calcium nitrate.

Plants in Construction and Operation

Both the process of the Badische Anilin- u. Soda-Fabrik and of Birkeland and Eyde require cheap water power, before they can be carried out profitably. The waterfalls in Norway, which, owing to the climate, have a fairly constant supply throughout the year, are particularly suitable. The Badische Anilin- u. Soda-Fabrik secured the right of using several falls there, and commenced by putting down an experimental plant at Fiskaa near Christiansand, A few thousand horsepower were available, and manufacture was started in the autumn of 1907.

In the meantime the Norsk Hydro Elektrisk Kvaelstof-Aktieselskab, that is, the Norwegian-French Company founded by Birkeland and Eyde, has commenced building a factory at Notodden to use up 30,000 h.p. Finally, toward the end of 1906, the Badische Anilin- u. Soda-Fabrik and its two allied firms, the Farbenfabriken vorm. Friedr. Bayer & Co., of Elberfeld, and the Actiengesellschaft fur Anilinfabrikation, in Berlin, on the one side, and the Norwegian-French concern on the other side, combined forces and floated two new Norwegian companies. These were: (1) A power company with a capital of 16,000,000 kronen, whose duty it is to develop and bring into harness further Norwegian waterfalls, and (2) the Norsk Salpeterverker with a capital of 18,000,000 kronen, which is concerned in building and running Norwegian saltpeter factories, making use of the power supplied by the first company. The two parties have come to an arrangement as to the exploitation of their patents outside Norway, and the granting of licenses lies in the hands of the Badische Anilin- u. Soda-Fabrik. The works at Christiansand and Notodden remain the special property of the original owners.

The first large factory erected by the new Norwegian companies will be situated in the interior of Telemarken on the Rjukan, one of those immense waterfalls in Norway. The total fall of 1820 ft. is divided into two steps, and, with a flow of about 11,000 gal. of water per sec., is capable of yielding a quarter of a million horsepower. The upper fall is now being developed, and with 10 turbines will provide about 140,000 h.p. It is expected that the factory will start running in about two years' time. The saltpeter will be carried along 29 miles of standard gaged railway, and by a ferry along Lake Tin, which is 25 miles in length, until it reaches Notodden, from here it will be transported via Skien to the sea. At present, the Norsk Hydro Kvaelstof-Aktieselskab is using up 30,000 h.p. at its factory at Notodden, where 35 of Birkeland's furnaces have been erected, and, at the present time, an experimental plant on the system of the Badische Anilin- u. Soda-Fabrik is being constructed there, in order to determine which type and size of furnace is most suitable for erection at Rjukan. Water power on the Matre and on the Tin in West Norway have been acquired, and will be held in reserve for future use.

In Germany, the water power suitable for the production of saltpeter is very limited. In South Bavaria, the Alz is able to supply sufficient power for a moderately large factory, and negotiations have already taken place with the Bavarian government, with regard to a scheme for the production of 50,000 h.p., and the erection of a factory near Burghausen. Negotiations have also been going on for some time with a view to the introduction of the manufacture into this country, but here also suitable water power is hard to find.

Nitrolime or Air Saltpeter

The production of air-saltpeter requires, it addition to electrical power, only the very cheapest materials, namely, water and limestone, whereas, in order to produce nitrolime, coal has to be employed, and, in addition, the nitrogen used in the process cannot be taken in the form of air, but first must be separated from the oxygen. Moreover, there are other points in favor of the production of air-saltpeter. Not only has the nitrogen contained in it a higher value than that in ammonium sulphate, or in nitrolime, but, by the oxidation of nitrogen, the nitric acid, nitrates and nitrites which are so indispensable in the chemical industry are obtained. These compounds have a higher value than air-saltpeter, the nitrogen in nitric acid being worth more than twice as much as that in ammonia. The prospects of a profitable conversion into nitric acid, of the ammonia obtained from nitrolime, appear very doubtful.

Another factor which must not be underestimated when considering the advantages of the new air-saltpeter industry, is its non-participation in the destruction of the valuable coal deposits, which have been stored up for us during such countless ages. It obtains the power it requires from water, or as it has been fancifully termed, "white coal," which can be employed over and over again without being exhausted. It is significant, too, that for this industry the larger the waterfalls the greater is their usefulness.

We have consequently every reason, from such different points of view as those of the agriculturist, the industrial chemist, and the whole of mankind, to hope that the new process for the combustion of nitrogen will continue to develop and flourish.

Sand Lime Brick

According to the U. S. Geological Survey, the sand-lime brick industry is a comparatively new one in the United States, having had its beginning in Michigan City, Ind., in 1901. Its progress was slow at first, the value of the production in 1903 being only $155,040. From that time the value increased each year until 1907, when the maximum of $1,225,769 was reached. In common with other building materials there was a decrease in 1908 in the production of sand-lime brick to $961,-226. The number of plants reporting made a rapid growth from 16 in 1903 to 94 in 1907, with a slight decrease in 1908 (to 87).

Common, front, and fancy brick were manufactured from sand and lime in 1908. The average price per 1000 for common brick was $6.63, as against $6.61 in 1907, and $6.71 in 1906; for front brick the price was $12.16, against $10.96 in 1907 and $10.42 in 1906. In 1908 common brick composed 83.57 per cent. of the value of all bricks and front brick 15.37 per cent.

Thirty States reported both in 1907 and 1908, Alabama dropping out of the list in 1908 and Montana appearing. Of the individual States Michigan, as in 1907, was the leading State in 1908, reporting bricks valued at $138,809. Florida was second in both years.

Transvaal Gold Returns

At the beginning of August there were 72 mines and mills operating in the Transvaal, the mills reporting a total of 9620 stamps. The gold production for August and the eight months ended Aug. 31 was, in ounces:

	1908.	1909.	Changes.
August.....	587,813	611,537	I. 33,724
Eight months	4,572,225	4,869,889	I. 296,764
Eight months value.....	$94,507,891	$100,642,003	I. $6,134,112

The increase for the eight months was 6.5 per cent. The labor return shows that on Aug. 31 there were 146,921 negroes and 5361 Chinamen employed; a decrease of 2553 negroes and 9 Chinamen, as compared with July 31. As compared with August, 1908, there was an increase of 14,582 negroes and a decrease of 7052 Chinamen.

At the Carn Brea & Tincroft mines, according to the directors' report just published, total costs per ton of ore mined have been reduced, during the half year ended June 30, 1909, from 23s. 2.81d. to 22s. 5.13d. During this period 2035 tons more of lode material were raised and treated than during the preceding half year; the material mined produced 34.55 lb. tin per ton of ore.

The Central Zinc Company

The works of the Central Zinc Company (a subsidiary of the Sulphide Corporation), recently erected at Seaton Carew, near West Hartlepool, on the northeast coast of England, were described in *Engineering*, Jan. 29, 1909, of which the following is an abstract. The works are laid out for a capacity to smelt about 35,000 tons of blende per annum, producing 10,000 to 12,000 tons of spelter. A general plan of the works is shown in Fig. 1.

The works are designed to recover sulphuric acid. The distillation furnaces are of the recuperative type.

The pottery is 315 ft. by 55 ft. 9 in., inside. At one end it has two rooms, the full width of the building and 50 ft. long, which contain the clay-crushing and molding machinery. The bottom floor of the remainder of the building is left open, and waste gases from the distillation furnaces are carried through flues underneath, so as to dry the clay which is stacked above. The upper floor of the building is divided into 15 rooms, heated by steam for drying the retorts. A corridor runs the entire length of the building in front of the drying room. A cross passage leads over a bridge to the distillation-furnace houses. The upper floor of the pottery is constructed of reinforced concrete, and is equipped with a tramway of 2-ft. gage. The building itself is a steel-panel structure, the walls and partitions being constructed of hollow concrete blocks. The blocks for the outer walls are 10 in. thick, 32 in. long and 9 in. deep, with a 3½-in. air space. The blocks for the partition walls are 4½ in. thick by 32 in. long by

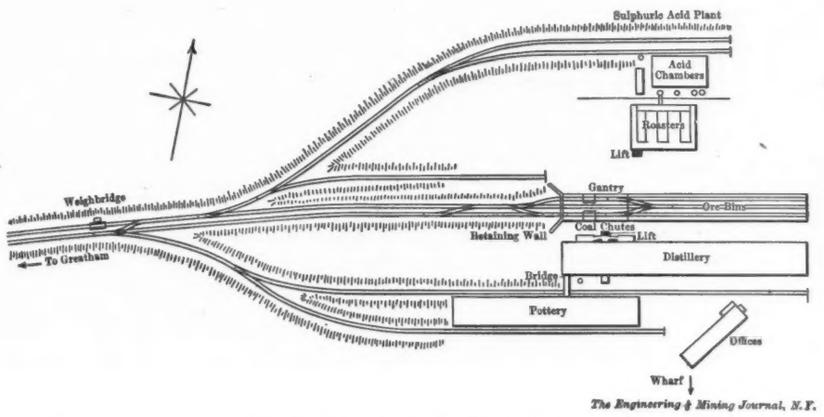


FIG. 1. GENERAL PLAN OF WORKS

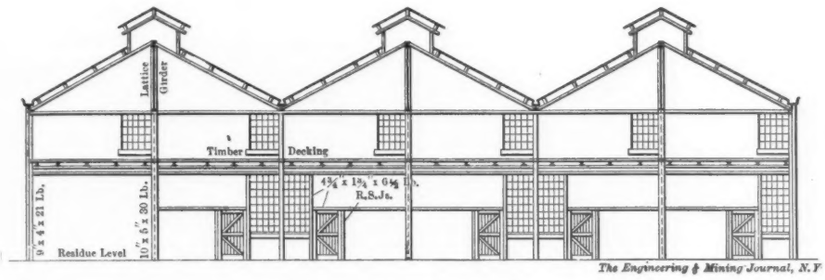


FIG. 2. ROASTING HOUSE

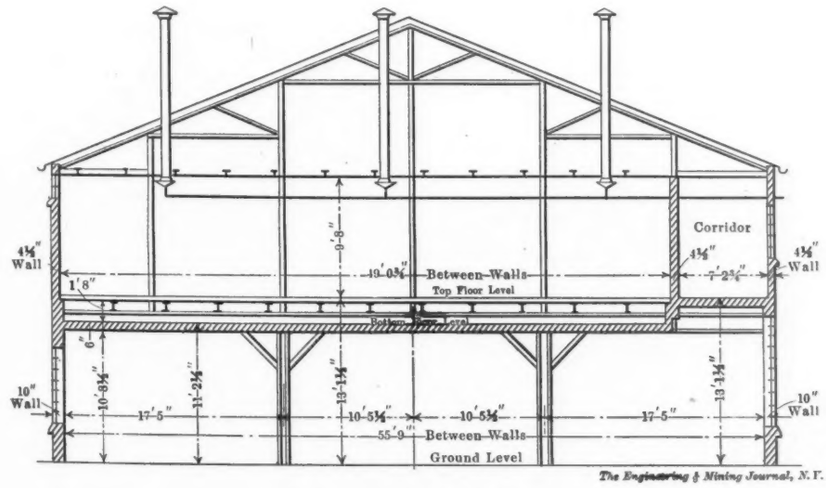


FIG. 3. DISTILLATION BUILDING

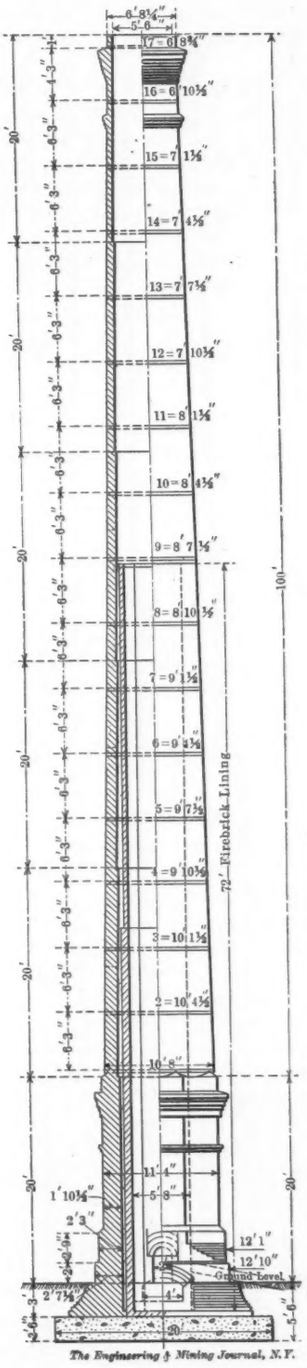


FIG. 4. CUSTODIS CHIMNEY

9 in. deep, with an air space 1½ in. wide.

The floors of the drying room are double, i.e., above the reinforced concrete a second floor of timber grids is laid. The steam-heating pipes pass between these floors. Each room is 47 ft. long and 17 ft. wide, and when full contains 300 to 400 retorts. There are ventilating holes in the bottom floor and in the roof which enable the circulation of air to be controlled properly.

The roasting furnace is a steel-panel structure 105 ft. long by 76 ft. wide, the walls of this building being hollow concrete blocks 4½ in. thick. This building is shown in sectional elevation in Fig. 2. The roof is laid with boards, over which rubberoid is placed.

The distillation-furnace building is a steel frame, 414 ft. long by 56 ft. 6 in. wide, covered with galvanized corrugated iron. It is designed in the modern way with upper floor for the service of the furnaces. This floor is built of reinforced concrete.

Tin Deposits of the Transvaal

SPECIAL CORRESPONDENCE

The Transvaal geological survey has just issued a valuable report on the Transvaal tinfields. From the mining point of view the most interesting part is the chapter by the inspector of mines for the Pretoria district on the economic possibilities of the various prospects referred to in it.

The Potgietersrust tinfield is the only one from which any quantity of tin has yet been produced. The tin ore now mined here is of high grade, but occurs in the form of peculiar cylindrical pipes or chimneys in granite, in which it is found expensive to work. These occurrences range over five farms, namely, from south to north, Solomonstempel, Sterkwater, Roodepoort, Groenfontein and Zaaiplaats. The first and last of these belong to two companies named after the farms. Of the former the government inspector of mines has a poor opinion, and states that the "ore chimneys have died out or become impoverished." In view of the small amount of prospecting that has been done there his condemnation seems altogether too sweeping. Zaaiplaats has proved the best of the line. The remaining farms belong to and are being worked by the Transvaal Consolidated Lands, Ltd., and are spoken of well.

The most promising tinfield, however, is the Rooiberg, but the inspector of mines practically contents himself with a description of the plant and gives no clue as to what its possibilities are.

The Rooiberg, or Red hills, lie some 40 miles west of the village of Warmbaths. The owners of the tin claim of that name are exploiting five different tin-bearing fissures in the quartzites and have opened up a mine to a depth of 300 ft. vertically. A large amount of development work has been done, and about 50 tons of black tin per month are being produced. The ore-bearing fissures have in many cases been worked by the ancients, and tin prospectors are reminded that until quite recently these were not recognized as tin deposits and were neglected under the impression that they were iron deposits, though they possess all the characteristic features of tin deposits. In one of the several types of lode in this area rich tin ore was found parallel to the bedding planes of the wall rock; but it is from the poorer and more regularly defined lodes that a steady production of tin is looked for.

Not far off is the Weynek tin mine. The ore here occurs in two small parallel veins in quartzite, filled with crushed lode matter and carrying varying amounts of tin. They are about 18 in. wide, show for a considerable distance on the strike, and have been largely worked by the ancients —as they are termed in the report, probably incorrectly—who have extracted quantities of the softer and richer portions of the tin ore. The present owners are concentrating their work upon one of the tin-bearing veins and have sunk an inclined shaft to a depth of 400 ft. in the orebody. A reduction plant is in full swing, and about 75 tons of tin have been produced. "It is fortunate that the capital of the company is small, as the property is of limited extent and low grade," says the report.

At Doornhoek, worked by the South African Tin Company, the tin occurs in fissures in shales which have been filled with brecciated shale and fine-grained tourmaline rock, and show signs of permanency on both strike and dips. "In my opinion," says the inspector, "the payable ore is at present confined to the eastern portion of the property where a large amount of development has disclosed some good runs of tin-bearing rock. The best and eastern portion of the property has been opened up to a depth of 200 ft. and, generally speaking, it would appear that as a low-grade proposition, the property has considerable possibilities.

A first-class reduction plant is in course of construction and ought to be producing tin in a few weeks. The adjoining farm Kromkloof has similar tin-bearing fissures in the shales; the ore contents, however, have so far proved poor and the property has been closed down for some time. Work is to be started in the lower levels again shortly.

The Bischoff company reports a large area of payable tin-bearing alluvial ground on its farm Zwartkloof, which want of water has hitherto prevented it from working. Now that the construction of a large dam has been sanctioned, this area should be thoroughly tested during the next 12 months. A full and extensive report upon this alluvial area was made by two well known engineers some time ago, their opinion being that the venture given water, was a highly payable one. It would be absurd for anyone to criticize the Bischoff alluvial report without taking the same time and pains in testing that the company's engineers devoted to the work and, until the water test is applied, their opinions must be accepted as correct. Speaking generally, the Transvaal has not yet discovered any first-class alluvial propositions, deep alluvial deposits over large areas being rather exceptional and values being seldom evenly distributed enough to support large companies.

About six miles from the Bischoff property and close to Warmbaths, a large alluvial tin deposit was reported some time ago on the flats along the Plat river. Investigations showed that the alluvial deposit was of exceptional depth and extent, but beyond small quantities of iron derived from the surrounding formations no other minerals were discovered.

A certain amount of so-called alluvial tin has been obtained in the vicinity of the rich orebodies at Potgietersrust but the mineral is directly derived from the disintegration of the rich pipes and has not traveled any distance.

The tin industry is comparatively new in the Transvaal, and it has taken and will take some time for the ordinary prospector to accustom himself to the work of efficiently testing all classes of Transvaal tin-bearing formation. In the granites the mineral is usually easy to determine by the naked eye and in the pan, but even in this class of rock varieties of ironstone are apt to be mistaken for tin. In the felsites, shales and quartzites the tin is often very finely divided indeed, and prospectors, unless they have an intimate acquaintance with the vanning shovel, may easily overload it, or considerably underestimte the actual value of a particular ore.

The inspector of mines includes his report as follows: "In my opinion we have no tin property at present that will support the enormous capital usually placed on the shoulders of a new mining industry, but we will obtain comparatively small quantities of metal from a number of working mines if they are given fair chances."

As a matter of Pacific coast history, it may be mentioned that the first application for a patent for a mine under the act of July 26, 1866, was for the Penon Blanco mine two miles north of Coulterville, Mariposa county, Cal. That act was the first passed in the United States relating to mining and was the predecessor of the present law of May 10, 1872. Another historical fact in connection with California is that in Jameson's *Mineralogy*, published in Edinburgh in 1816, it is stated on the authority of Humboldt that "on the coast of California there is a plain of 14 leagues in extent, covered with an alluvial deposit, in which lumps of gold are dispersed."

Death from Electric Shock at Clifton Colliery

By Sydney F. Walker*

Unfortunately a good many deaths have occurred in collieries in the United Kingdom, from electric shock, and a large proportion of them have been at the face of the coal, in connection with electrically driven coal-cutting machines. In all cases the accident has occurred through the failure of the insulation of some part of the machine, or of the trailing cable. The electrically driven coal-cutting machine presents the most difficult problem that, to my mind, the electrical engineer has to deal with. For safety he requires space, and space cannot be allowed him at the face. For efficiency also he requires weight, and the lighter the machine the more suitable it is for working at the face.

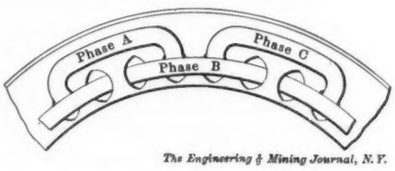


FIG. 1. SHOWING HOW THE WIRES ON THE STATOR COILS OF A THREE-PHASE MOTOR CROSS, AND THE DIFFICULTY OF INSULATING THEM WHERE THEY CROSS

Putting aside for the moment the question of efficiency, the matter of space for insulation is of the greatest importance, and it is not easily provided. In coal-cutting machines driven by continuous-current electric motors, space must be found for the starting resistance and switch, and it is, therefore, of considerable advantage to employ three-phase motors, providing that the squirrel-cage form of rotor is used, with which no starting resistance is required. To enable the squirrel-cage rotor to be used, however, a certain amount of efficiency has to be sacrificed, but the additional security is certainly well worth the sacrifice.

The Insulation of the Wires

Under the best conditions, however, the matter of the insulation of the wires is a difficult one. The stator windings of the three-phase motor must be connected directly to the electrical service, and the full pressure of the service, whatever it may be, usually 500 volts or so, must be present in the stator coils. Hence, if one of the coils is connected with the frame of the machine, the machine itself becomes part of the electrical service, and will give anyone a shock who touches it, unless special arrangements are made to prevent it.

The insulation of the stator coils is also difficult, on account of the space available. A study of any diagram of a three-phase motor will show one of the reasons of the difficulties of insulation. There are three distinct sets of coils of wire on the inside of the containing cylinder of the motor, each set of coils receiving currents of the same pressure, but quite independently of each other, and the working of the motor depends upon the three sets of coils being carefully insulated from each other. As will be seen from the diagram, Fig. 1, the coils are obliged to overlap each other at the ends of the containing cylinder, and it is there that space is required for insulation. Further, in the construction of the stator, if a small bur is left in one of the channels in which the wires are laid, the vibration of the machine will gradually cause the bur to wear through the insulation, and connect that coil with the electrical service.

Another point where difficulties of insulation arise is in the connection to the supply service. It is now the common practice to fix what is called a gate-end box, as conveniently to the machine as possible, a flexible cable carrying the current from the box to the machine. The gate-end box contains a switch and fuses, and connection is made to the machine, by a plug, on something the same lines as those that are used pretty well everywhere now, for connecting flexible cords to portable lamps, in houses, offices, etc. The plug is a great possible source of weakness. It is exposed to constant vibration, to dirt, oil, etc. In some cases the cable is taken through an insulated bush in the frame of the machine, and connected permanently to the terminals of the motor. In those cases the weak points are the insulated bush and the ends of the cable. In one case which occurred in Scotland, the insulating bush failed, one of the conductors in the flexible cable came into contact with the frame of the machine, and a man was killed when taking hold of the haulage rope. There is the danger also of the ends of the wires breaking off, or becoming loose, and coming into contact with the frame of the machine.

The Only Remedy Is "Care"

There is one really sound remedy for all these troubles, and only one, viz., care. As electrically driven coal-cutting machines are better known, and a class of workers grows up who have some knowledge of electricity, and who have learned care, probably accidents will become less and less. Meanwhile, the present method adopted, as instructed by the Home Office regulations, is to earth the machine, and various devices are employed for the purpose. There are two difficulties in connection with this. It is difficult to obtain good earth at the face of the coal, in a great many collieries, and in addition, there is always the danger of the earth wire breaking, or connection between it and the machine failing, as it did at Clifton colliery.

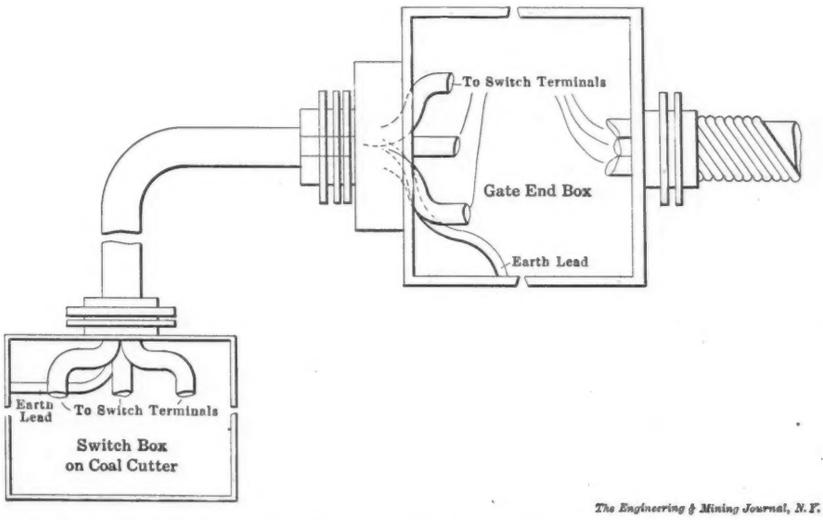


FIG. 2. SHOWING HOW CONNECTIONS ARE MADE BETWEEN THE GATE-END BOX AND THE COAL CUTTER. THE FIGURE SHOWS 3 WIRES IN A CABLE AND A FOURTH FOR EARTH

The electrical engineer of a group of North country collieries has introduced a gate-end box and a cable, which he claims provide against all of these troubles. The cable contains three or four wires, as the case may be, three wires with a continuous-current service, and four wires with a three-phase service, the fourth wire being the earth wire. Earth is made by means of the armor of the cable, and it is arranged that unless the earth wire at the machine is connected to the machine, and that the machine itself is earthed, the gate-end switch cannot be closed, and, therefore, no current passes to the machine. The weak point of this appears to me to be that the earth itself may fail, if the armor of the cable is broken by a fall.

Earthing the whole apparatus protects anyone who touches it by making the pressure between it and the ground, and, there-

*Consulting engineer, Bloomfield Crescent, Bath, England.

fore, between it and the man who touches it, nil. Fig. 2 shows a typical arrangement for earthing the machine by using a fourth wire in the flexible cable between the gate-end box and the machine.

Safety Precautions in Alabama Coal Mines

SPECIAL CORRESPONDENCE

The following circular letter has been sent out in the mining districts of Alabama, to avoid, if possible, catastrophes in the collieries:

OFFICE OF STATE MINE INSPECTORS,
Birmingham, Ala., Oct. 4, 1909.

To the Alabama Coal Mine Operators:

About one year ago the United States Government opened an experimental and testing station at Pittsburg, Penn., for the purpose of experimenting with coal dust and gas, to ascertain their explosive qualities, and to test the different explosives that are used in coal mines for blasting purposes. As a result of these tests the United States Geological Survey, which department has charge of the testing station, issued a list of explosives that have been tested and considered safe in coal mines. Neither black powder or dynamite appear on the list of permissible or safety explosives.

This department has been making an effort to prohibit the use of dynamite in the mines of this State, and has been very successful. We have also condemned the use of black powder where it is practicable to use one of the safety explosives, especially in dry and dusty mines. We have condemned the use of dynamite in all coal mines.

All the large coal-producing companies and a number of smaller ones are using safety explosives, but there is some dynamite being used; and it is with a view to stopping the use of dynamite entirely, and black powder where it is possible to do so, that prompts this department to issue this circular.

As cold weather approaches, the danger of explosions from dust and blown-out or windy shots increases. This department desires and solicits the coöperation of the coal operators in our efforts to prevent a recurrence of the disasters that have occurred each winter for the past five years, and which have been very destructive to life and property; and in order to do this we make the following recommendations:

1. That you prohibit the use of dynamite in your mines and use one of the permissible explosives in its place.

2. That where it is practical or possible to use one of the permissible or safety explosives in the place of black powder, and especially in mines that are dry and dusty, or that generate large quantities of explosive gas, safety explosives be used.

3. That where your mines are dry and dusty, you have them watered, roof, sides and bottom, as often as necessary to keep down the dust.

4. That you send clay into the mines and distribute it along the headings where it will be convenient for the miners, and that they be required to use it for tamping their shots.

5. That the operators of mines where black powder is being used have tests made with safety explosives, and if the safety explosive proves successful in breaking the coal, that it be used instead of black powder.

These recommendations are made in compliance with Section 1026 of the mining law, and you are respectfully requested to comply with same.

ED. FLYNN,
Chief Mine Inspector.
JAMES HILLHOUSE,
ROBERT NEILL,
Associate Mine Inspectors.

F. F. ROGERS,
JAMES BEATTIE,
GEORGE BARBOUR,
T. H. TINNEY,
Board of Examiners.

Cooperative Coal Mining

SPECIAL CORRESPONDENCE

In an attempt to solve some of the problems respecting the relation of capital and labor, an experiment has lately been inaugurated in the form of a cooperative coal mine near Terre Haute, Ind. Some of the features of this venture are unique. The property consists of 1260 acres of coal land, and the mine is capable of producing about 600 tons per day. The plant is equipped with modern machinery and the physical conditions relating to the coal seams are unusually favorable.

The miners are mostly native Americans, and many of them are already owners of property. The miners entered into negotiations with the owners of the property, and as a result, the following provisions were embodied in a one-year lease: 1. The miners shall form a corporation with legal responsibility. 2. All supplies for repairs about the mine and all labor must be paid in cash. (This was necessary so that no labor or material liens could be entered against the property.) 3. The mine must be operated in accordance with the plan already adopted for its development, and in accordance with the best engineering practice. The mine must be kept in good physical condition.

COMPENSATION FOR MINE OWNERS

The compensation for the mine owners was to be determined as follows: 1. Rails, props, and other necessary supplies shall be bought out of the gross receipts for coal sold. 2. For three months miners and all laborers employed in producing coal shall be paid in full in accordance with the scale governing the miners' union in the Terre Haute district, before any profits shall be distributed. 3. For the first three months the lessor company shall receive one-fourth of the net profits after deducting wages and expenses. If there are no profits, the owners of the mine receive nothing for the coal taken out or the use of their machinery. 4. After three months the lessor company shall receive 5c. a ton and one-fourth of the net profits after deducting wages and expenses.

A charter was obtained from the State of Indiana incorporating the concern as the "Union Mining Association." A company was formed; it adopted by-laws containing the usual provisions and the following distinctive ones:

1. All stockholders must sign these by-laws.

2. No debts shall be incurred by this company and no director or body of directors shall have authority to contract any debts or obligations. Purchases must be made only for cash.

3. The association and members of this association shall be governed by the Terre Haute agreement concerning scale of wages and mine conditions.

4. Every person working in or around the mine shall be a stockholder in the Union Mining Association.

5. Every stockholder agrees to divide losses accruing by reason of the operation of this mine and hereby instructs the bookkeeper of the company to check off his wages any losses which accrue to said company by reason of the operation of the mine.

6. Every stockholder hereby agrees to have the said bookkeeper check off his wages the sum of $5 to pay for one share of stock in the Union Mining Association.

7. Any member shall have the right to give up his membership by assigning his certificate of stock back to the treasurer of this company. The Union Mining Association, however, shall be in no wise liable for the return of the $5 paid for such stock. Only one share of stock shall be issued to one member, and each member shall have only one vote.

9. Each member hereby agrees to hold no other member, or the association as a body, responsible for his death or any accident which may befall him during his work in or around the mine.

The company started out with a membership of 85. The capital stock at first, therefore, was only $425. A large capital is not necessary for such an association, as the principal outlay of money in coal mining is for miners' wages, and in the matter of wages the men were both creditors and debtors.

The miners elected seven of their number as directors. The directors elected a president, secretary-manager, treasurer, and sales agent. The only salaried officer besides those in or above the mine was the secretary-manager, who receives $100 a month, with his salary subject to assessment in case losses accrue to the company.

A careful examination of the company's books and pay-rolls shows that up to the present time the scheme has been quite a success. The pay-roll for one month shows that every man received as much as $100; one miner was paid $210 for the month. The mine has run steadily while other mines in the locality have worked only three or four days in the week.

On one pay day the assessment ran as high as 25 per cent. However, even at that rate, the monthly wages still ranged from $80 to $150 a month—twice as much as the miners in other neighboring mines were earning.

The friends of this plan of coöperative mining claim that the scheme will solve many of the problems and difficulties that now exist between employer and employees. These advocates also say that the plan gives the mine owner in a low market a minimum price for the depletion of his coal land. That it gives the miner, for his wages, all that the product of his labor brings in the market. That in a good market it gives the mine owner a share in the good times, and gives the miner compensation for lower wages in hard times, and automatically increases his wages without waiting for the often tardy advance of the employer. It is also argued that this kind of coöperation will settle many labor disputes, and that it will help conserve the great fuel resources of our nation.

A Safety Lamp Glass Test

SPECIAL CORRESPONDENCE

G. Chesneau, secretary of the Permanent Commission of Scientific Researches on firedamp and explosives used in mines, has presented a new manner of testing the glass of safety lamps. It must be reminded that these glasses are constantly submitted to varying temperatures and that such variations may be quite sudden and cause the glass to break. Therefore, it is of the utmost importance to get glass that will show a great resistance under the circumstances obtaining in mines.

The tests designed by Mr. Chesneau are simple. The first one consists of placing the glass in boiling water and quickly placing same in cool water at 15 deg. C. The second one is called by Mr. Chesneau the Berzelius burner test and is described by him as follows:

METHOD OF TESTING

The glass to be tested is left for 24 hours in a dry place and then put cold over and just in line with the axis of a circular Berzelius gas burner of ordinary pattern with three burners. The burner used by Mr. Chesneau is 45 mm. outside diameter, the mean diameter being 40 mm. and the slot 2 mm. wide. The air inlet consists of three circular holes 14 mm. diam. fully opened during the test. The glass rests upon another circular sleeve of glass or metal 50 mm. diam., which rests upon the support of the burner. The position of this sleeve is so adjusted that the bottom of the glass to be tested is about 8 mm. above the orifice of the Berzelius burner. Over the glass another glass or metal sleeve of the same diameter and hight is placed. Asbestos rings are put between the various sleeves. By this arrangement a powerful draft is obtained as well as a regular flame which entirely fills the tested glass. Gas is introduced in the burner under a pressure of 50 mm. of water, controlled by a pressure gage fitted on a small header of at least 1 liter capacity and connected to the burner by a hose, 1 ft. long at the most. The supply of gas under this pressure is regulated by two valves placed one before and one after the header in such a manner that the hight of visible flame is between 25 and 30 millimeters.

When everything has been adjusted as explained above, gas is lighted and the time elapsing, before the glass breaks, is reckoned.

In any case gas is shut off after 5 min., because the glass, being red hot at that time, no change would occur by a longer heating. It is obvious that under identical circumstances, the longer the time spent before the glass breaks, the greater will be its resistance to the variations of temperature.

Mr. Chesneau has shown that this test was reliable because similar glass will break after the same length of time, and that experiments carried on on the same lines as above will show the same results.

The glass which gave Mr. Chesneau the best results came from the Iéna glass works and the Baccarat glass works. The Iéna glass is a silicoborate of sodium but little alkaline, with very small quantities of lead and zinc. It is somewhat yellowish and has a very small coefficient of expansion. The proportion of glass which broke in the Berzelius test was 10 per cent., while all the samples stood the water-cooling test.

The Baccarat glass is intended to have a greater elasticity. Its composition is as follows: Sand, 75 parts; Co_3NaH, 13; Co_3Mg, 9; ZnO, 6; minimum, 50 parts.

These glasses are also yellowish. Tests carried on 10 glasses proved that all stood the water-cooling test, and also that on 20 glasses, all stood the 5-min. Berzelius test.

Such qualities of glass should be adopted by the colliery owners for their safety lamps. They are more expensive than the other lead glasses used in mines for this purpose, but they last longer and may prove to be economical. In any case their reliability should be taken into account.

Indiana Coal Report

SPECIAL CORRESPONDENCE

The tenth annual report of James Epperson, State mine inspector, was issued during the past week in connection with the 39th annual report of the State geologist's department. Mr. Epperson's report goes into detail and says that coal is produced in 18 counties of the State. According to his report there were 11 new companies organized during the year (ending June 30), making a total of 104 coal-mining companies operating in the State. The number of mines abandoned for various causes was 28, two old mines were reëquipped and 12 new mines opened and installed with modern equipment.

The total number of men employed in the mines was 19,092, to whom were paid in wages $10,304,869.44. The mines used 401,347 kegs of powder, and the total production of all mines working more than 10 men was 11,999,304 tons. There were 45 fatal accidents, 375 serious accidents, and 452 minor accidents. There were 13 accidental injuries to mine property and 98 prosecutions of owners and employees for violations of the State mining laws.

RECOMMENDATIONS BY STATE INSPECTOR

Mr. Epperson supplements his report with a number of recommendations for the consideration of the next legislature. One is, that the law governing the use of powder be amended so as to regulate more effectively the amount of powder to be used in a "shot." He recommends that a law be enacted making it unlawful to recharge a drill hole which has once been charged and fired or attempts made to fire it. He also deems it advisable to have the drill-bit law amended so as to prevent the use of bits larger than 2½ in. in diameter and would prevent miners clearing a working place of gas by the method known as "bushing." Mr. Epperson further recommends that the law be amended so that when violations occur and extreme negligence is in evidence resulting in the loss of life, the charge should be manslaughter and the violators punished accordingly.

Mr. Epperson, in his report, cites two cases of record during the year where justice demanded that the violators be punished by imprisonment. One of these was the case of the mine superintendent, who compelled a number of miners to go into the mine before it had been examined

by the fire-boss; the other was the case of a man who, over the protest of his fellow employees and against the dictates of good judgment, placed a shot which caused the loss of two lives.

Mr. Epperson states in his report that the mines of Indiana are being sunk to coal beds lying at greater depths each year, thus increasing the avenues of danger which are attendant on deep-vein mining, and while some benefits may be derived by invoking the aid of science, without discipline, the daily and yearly increase in the number of mine accidents can never be checked.

Mine Ventilation

By H. J. Nelmes

Efficient ventilation is now regarded as the principal factor in the design and operation of a modern coal mine. Possibly the best method of ventilation that can be designed is what is known as the four-entry system in which you drive four main entries and four face entries; in this plan, two entries are used for intake and two for return. This method, however, is costly when you compute the amount of coal used up in driving four entries, the extra gob that must be handled, the yardage which has to be paid for and the bratticcs.

A Suggested Method of Development

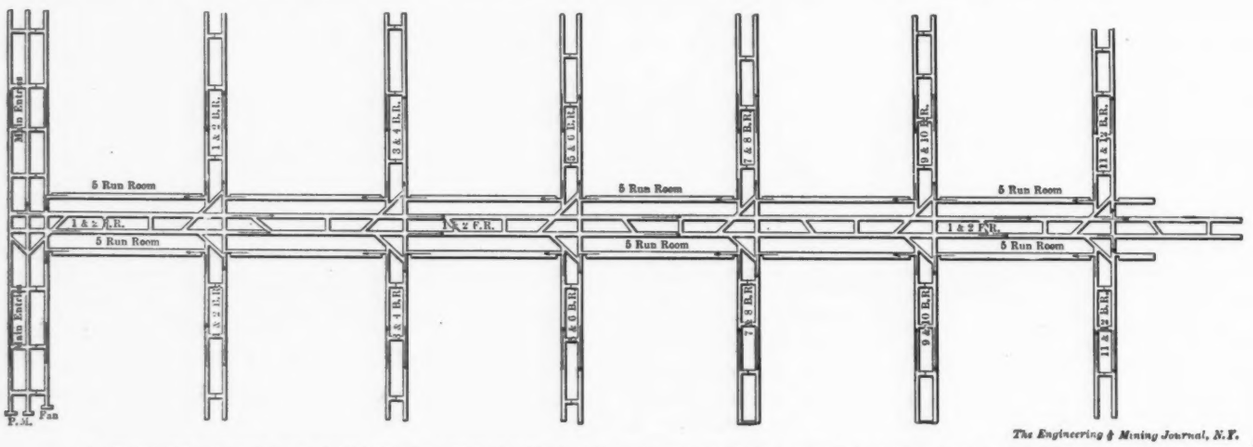
Instead of driving four entries, I would suggest that coal operators try the method projected on the accompanying plan.

Three main entries are driven, and two main face entries are turned off at 90 deg. Other main entries are driven every 1400 ft. The main and face entries are driven on 50-ft. centers, and should be from 10 to 12 ft. wide. Parallel to every face entry, and on each side, drive a room 15 ft. wide, which will be used for a return airway. This room will not cost anything for yardage. It is driven on 50-ft. centers from the face entry. The rib between Nos. 1 and 2 rooms should be about 27 ft. wide, and No. 1 room instead of being widened out from the face entry as the plan shows, should be widened out toward the face entry so that when the face entries are finished and the stumps and chain pillars are being removed, the rib between No.1 and No. 2 rooms can be gotten from No. 1 room.

In this plan, the air is intake on two of the mains and also on both face entries; this insures a split at the top of the face entries, and it is not necessary to keep brattices or doors on the face entries, except at the last pair of butts turned. Of course, the room that is used for a return airway must be driven as fast as the face entries.

By putting in an overcast at the bottom of any pair of butts, it is possible to split the air at any desired point. Splitting the air is certainly the best method of mine ventilation, and it is a fact that you can get more splits by this method than any other which I have seen. The overcasts and doors necessary to this plan of ventilation are not shown on the accompanying plan, as they are simple in the extreme, and can be easily located.

If a mine is using electric locomotives for haulage, this method insures a convenient plan for mine haulage. The locomotives would be able to pull the empties in on the No. 2 face entry and get the loads off No. 1 face; it would also be unnecessary to do any swinging.



A SUGGESTED SYSTEM OF COAL-MINE DEVELOPMENT THAT INSURES GOOD VENTILATION AND ENABLES EFFICIENT HAULAGE

In a gassy mine where it is considered dangerous to convey electric current to the coal face, the general power advocated in such cases is compressed air. This does not mean, however, that the compressors should be located on the surface, but rather that advantage should be taken of the cheapness and efficiency of electricity as a distributing agent, and consequently, install the compressor plant at the shaft bottom, or as near the face as electric current can be safely conveyed.

The Falsification of Coal Miners' Certificates

Special Correspondence

On Wednesday, Sept. 27, the grand jury of Lackawanna county, sitting in Scranton, returned presentments against 17 members of the old miners' examining boards. Six of the members are to be charged with extortion, and the presentments go on to say that the mine inspectors of the county have omitted to inquire into the validity of the miners' certificates, although the letter and spirit of the mining laws enjoin upon them the duty of seeing that these certificates are regularly and properly issued.

In a general way the grand jury finds that the mining laws have been violated continuously, and they place the responsibility for this state of affairs upon the mine examining boards and upon the mine inspectors.

It should, in justice to the mine inspectors, be pointed out that they absolutely deny that the law imposes upon them the duty of guaranteeing the validity of miners' certificates. They are called upon in specific terms to use all care for the protection of life in the mines, but they do not exercise, and by law are not required to exercise any supervision over the miners' examining boards, although they must have known, and indeed many of them could not deny, if they were inclined to do so, that these forged certificates have been in use among the miners, not only of Lackawanna county, but of every county in the anthracite-coal regions during the past 20 years. The grand jury holds them morally responsible for this state of affairs. But the law does not, and it now remains for the next legislature to make them legally as well as morally responsible for the validity of the certificates issued under the auspices of the mine examining boards, if it can be brought to do so.

The Miners' Examining Boards

The miners' examining boards are independent institutions, independent of control, either of the mine inspectors of the State Bureau of Mines or any other executive body. They are all miners. They were appointed by the county court judges and upon the court in the last analysis, if anywhere, the moral responsibility for their transgressions rests.

"Instead of the members of the examining boards meeting in public," says one section of the presentments, "and sitting together and holding examinations as required by law, every member of the board since his appointment has held meetings alone and has issued certificates alone, and has either signed the names of the other two examiners, or has had them signed in blank before the examination."

The grand jury also finds that in many cases, if not indeed in the majority of instances, no satisfactory evidence was brought before the miners' examining boards that the applicants worked two years in the mines as mine laborers. They find also that the provision of the act requiring the applicants to answer twelve questions in English has been invariably disregarded. In fact, the grand jury has only confirmed by its deliberate and official judgment what was a matter of unqualified notoriety in the anthracite regions during two decades.

One-half the Miners' Certificates Are Illegal

It has been asserted and reasserted, and seldom, if ever, denied, both in the public press and on the public platform, that 50 per cent. of the miners working in the anthracite regions at the present time are following their occupations upon illegal certificates. Many of these miner's certificates are alleged to be downright forgeries, others are said to have been sold to those who are in possession of them, while the vast majority of them have been issued under false representations of the qualifications of the men who obtained them, in one way or another. The issue of false or fabricated certificates to miners has become a public scandal in the anthracite coalfields, one that has been growing in volume and audacity with the impunity of those who have betrayed their duty and ignored the obligations which their position stipulated and implied.

The laws of Pennsylvania provide that no miner's certificate shall be issued to any person engaged in the coal industry unless he has passed an examination before a miners' examining board, and that he shall not be permitted to register for such an examination unless he has worked two years consecutively in the anthracite mines of Pennsylvania as a laborer, and that he shall be able to speak English, although it is not necessary that he shall be able to read it. In other words, that he shall be able to apprehend the instructions given to him by those who are over him. This law has been in existence during the past 18 years. It is a mooted point whether it would not have done much more harm than it has effected good, if it were honestly and scientifically enforced. But as it is, it is claimed by those who understand its operation, that three-fourths, if not four-fifths, of the fatal accidents that occur in the mines are unqualifiedly to be attributed to it.

It is not merely a source of imposition, but it is one which leads to the maximum of danger in the mines and the minimum of prevention. Since this measure became a law, fatalities in the anthracite mines have enormously increased, although it may be assumed that fatalities and accidents of a serious character would not be eliminated to the extent that some presuppose if a miner's certificate was a diploma of his efficiency, instead of being as it is under present conditions little better than a sham. As it has been so often said, mining is a dangerous occupation, its risks being inseparable from its pursuit. It might, however, be made much safer than it is, if preternatural ignorance was not guaranteed by the commonwealth of Pennsylvania to be the hall-mark of experience and efficiency through a miner's certificate, obtained through fraud or purchase.

One Recent Case

The death of a foreign "miner" at one of the Scranton collieries a few weeks ago has brought this question to a head. This man secured a miner's certificate through the usual channel. This certificate was signed ostensibly by the members of the examining board. One of the examiners did actually sign the certificate, and signed it also on the part of his fellows with the prefix "per." Under these circumstances, a certificate is absolutely worthless from a legal and an official standpoint. The man to whom it was issued was only 11 months in the country and never saw a mine in his life until he came to Scranton. He had only worked two weeks in the mine under the miner's certificate when he was killed. A saloon keeper who knew him informed the district attorney's office, and the matter eventually was brought to the attention of the coroner who held an inquest. As this man's death and the circumstances with which it is involved are not yet before the court, I will not discuss the matter here.

The question has been brought to an issue by this man's death, and that merely through an accident; but there are hundreds if not thousands of so-called miners working under similar conditions throughout the length and breadth of the anthracite coalfields, and this state of affairs will continue to exist until the law is abrogated or essentially modified. Although this act was pushed through the legislature by the political pressure brought to bear on the miners' representatives, so far from serving the end which the men had in view, it has had a diametically opposite effect, if we consider the problem in the light of an economical issue.

Twenty years ago, the mines throughout the anthracite regions were practically manned by native Americans, Englishmen, Scotchmen and Irishmen. But at that time, it was believed by the operators that unless there was some amelioration in the labor conditions at the mines, the English speaking miners would be able to command their own terms. Foreign laborers were introduced, and it is doubtful if the operators have gained anything by this move. Certain it is, that unprejudiced observation in the anthracite region has strengthened the opinion that the foreigner has demoralized the mining industry by driving out the English speaking miner to a greater or less extent.

Foreign Labor is Not Cheaper

If at his first introduction, the labor of the foreigner was cheaper, it is not so now. With a forged certificate and a union card in his pocket, he commands the same wages as the English speaking miner, and as a rule he is more arrogant, intractable and insubordinate. I heard an experienced mining engineer say a few days ago with all the responsibility attached to a public declaration, that the death rate in the anthracite mines would continue to increase, *pari passu*, with the increase of foreigners in the mines, and that his elimination would be an unmitigated economic blessing. However, as things now are, it is impossible to eliminate him. He is here, and he is here to stay. Is it possible to educate him? It is impracticable, if not impossible to do so in the mines, and it is almost hopeless to try to do so outside of the colliery.

Chief Inspector James Roderick of the Pennsylvania State Bureau of Mines, told me himself that he is rather underestimating than overestimating the number of forged certificates in the hands of foreigners when he places the total at 50 per cent. of the number that have been issued to foreign miners during the past 18 or 19 years. Things are not as bad as they were perhaps 10 or 12 years ago, for public opinion has in a measure been aroused to a sense of the danger which this state of affairs has created.

Chief Roderick has declared that very few English speaking miners have forged or faked certificates, accoding to his experience. Those of them who have been born in this country have been practically raised in the mines. They have graduated from being breaker-boys to mule-divers or gate-tenders, from gate-tenders to

laborers, and from laborers to miners. As miners, they should, and Mr. Roderick says they do know the practical side of mining. A certificate neither adds to their knowledge or certifies to its exactness. It is also true that those men who enter our mines after having worked the mines of England, Scotland or Wales, have a native conception of their personal dignity, which prevents them from seeking a certificate by other than fair means. It may be taken for granted, therefore, that the forged miners' certificates are for the most part in the hands of so-called foreigners, and the question is, as the law stands in Pennsylvania, can anything be done effectively to deprive these miners of the benefits that have accrued to them through laxity in the enforcement of the law, and the perjury, duplicity and corruption of the miners' examination boards.

The state legislature of Pennsylvania will not meet for nearly two years. During that time the law will remain as it stands. The grand jury of Lackawanna county which is investigating these forged certificates and the manner in which they were issued, will probably make recommendations and advocate a repeal or the amendment of the law. But this investigation, or even the conviction and punishment of a few members of the examining boards cannot lead to the cancellation of the certificates that are now in the hands of those who are not entitled to them. A miners' certificate duly signed by a board of three or more examiners is a legal certificate, and there it stands, the credential of a man, perhaps, who never saw a mine before he purchased what to him, and unfortunately too often to the foreman who accepts it at its face value, is the criterion of his ability as a miner.

It should always be remembered in discussing this phase of the situation, that before a man is entitled to work in a mine as a miner, he must have worked two years underground as a laborer, and that when he presents himself before a miners' examining board, he must be able to answer 12 questions in English. How can a man who is not able to speak two words of English consecutively and intelligently answer 12 questions in a language to which he is an absolute stranger? Yet it is under these circumstances and to men to whom the English language is as enigmatical as Sanscrit that 50 per cent. of the miners' certificates in the anthracite regions have been issued.

Under the Employers' Liability Act of the State of Pennsylvania, any accident caused by a miner having a miners' certificate clears the operator or operating company of all responsibility. Consequently, while this law stands, and while there are thousands of forged certificates in the hands of ignorant foreigners, the discipline at the mines will not improve.

"The great number of fatalities in the mines of Pennsylvania," says Chief Roderick in his last report, "show the necessity of remedial measures. Legislation of a proper kind would no doubt bring about a reduction, but the most prolific cause—carelessness on the part of the mine officials and employees—can only be removed by greater discipline; discipline that will enforce obedience to the laws and rules governing safety; discipline that will mete out severe punishment to the man in charge and to the employees who by their carelessness and recklessness place in constant jeopardy the men in the mines."

This is all true, but the recognition of a truth and alleviation of the abuses which it indicates are two different matters, as no one knows better than Mr. Roderick himself.

Colliery Notes

In any gassy place, the joints, if any, made in trailing cables, should be soldered. Screw clamps of any kind should not be used for this purpose.

When transmission lines from the generating station to the shaft or mine mouth are strung overhead, such lines should be supplied with lightning arresters.

Experiments in Germany have shown that to improve the product of a badly coking coal it is advisable to compress the charge by means of stampers in a special mold, of exactly the shape of the oven. The binding agent is simply the moisture left in the washed small coal. It is advisable to retain about 10 per cent. of moisture in the coal if the charge requires compression.

One of the most important points to consider before selecting an exhaust-steam turbine for colliery use, is whether a low-pressure or a mixed-pressure turbine should be installed. The low-pressure turbine utilizes the steam at a pressure between one atmosphere absolute and vacuum; the low-pressure machine should be installed in cases where a sufficient amount of exhaust steam is always available from such sources as fan engines or central power-station engines, or where a large supply is available, such as that from hoisting engines, etc. In cases where electric power is always required and where the source of supply is intermittent, or is only available for part of the working day, a mixed-pressure turbine should be installed.

Recent experiments carried on to investigate the stresses on hoisting rope in shafts, show that a rope 1⅛ in. in diameter, with a hemp core, and 789 ft. long, gave an average extension of 6 in. with the application of a static load of 4100 lb. Other experiments with different lengths and sizes of rope showed that the stretch was directly proportional to the load and the length of the rope, and inversely proportional to the frictional area; it was also proved that a live load would produce twice the extension of a static load. It was concluded after these investigations, that there is a time lag between the movements of the drum and the movements of the cage, and that the vibratory action thus set up is sufficient to mask the true acceleration of the hoisting drum.

Mine managers in America must eventually come to recognize the great value of the exhaust-steam turbines at colliery plants. It is conservative to estimate that 50 lb. of steam are required per hour per horse-power for all coal hoisted up a shaft; it is, therefore, certain that thousands of pounds of steam are poured into the atmosphere every hour from colliery hoisting engines alone. This great quantity of waste exhaust steam would be sufficient to drive hundreds of turbo-alternators. From actual practice it may be stated that the cost of installing an exhaust-steam turbine varies from $30 to $40 per kilowatt. The exhaust-steam turbine is practically the only machine that will turn the waste of the steam-hoisting engine to good account by providing a cheap, although limited, supply of electric power.

The opponents of the underground sprinkling system point to the fact that the disease known as ankylostomiasis has ravaged Westphalian mines, in Germany, to a greater extent than any other coal district. They also claim that the saturated currents, that are provided in these German mines, have affected the focus of the eyes of many miners, thus intensifying the presence of nystagmus among the miners. In solving this dust problem, a plan has been adopted at various collieries, whereby certain portions of the main roadway are kept scrupulously clean, and sometimes very wet. These particular stretches are known as isolating zones and are used to prevent the extension of an explosion through a certain stretch of entry. This practice is based on the belief that where combustible material is cut off, an explosion will cease. Certain considerations should be observed in providing these isolated zones; such zones should be specially constructed so that the solid coal will be largely excluded; it is also advisable to enlarge the area of the zone, or in some way reduce the velocity of the air current to a speed such that no coal dust will be lifted from the top of the cars that travel through. The length of a zone should be about 600 ft. and each zone should be whitewashed at regular intervals, and if possible, the track should be ballasted with small stones. In coal mines on the Continent, the general practice is to locate each isolating zone at a point just inside of where the air has been split, and where the velocity of the current is not high.

Concentration at the Blue Bell Mine

Some interesting data have been contributed by William Fleet Robertson, the provincial mineralogist of British Columbia, in the *Annual Report* of the minister of mines, regarding the early history of the Blue Bell mine and the concentration methods that have been adopted by this historic lead-zinc property, near Ainsworth, in the Kootenay Lake country. The outcrop was discovered in 1825 but little was done toward its development until 1864, when Sen. Hearst, of California acquired the property. The distance from transportation at that time ultimately led to its abandonment. In 1878, all the ground on the peninsula was located by R. E. Sproule and subsequently relocated by Thomas Hamill, litigation resulting. Sproule retained control of the Blue Bell but the mine was sold at sheriff's sale to pay the costs of the case. Hamill bought an interest for the Ainsworths, of Portland, Ore., and was shot and killed the next year by Sproule. The property then passed through various ownerships until purchased in 1905 by the Canadian Metal Company, which upon development found a sufficient body of concentrating ore to warrant the erection of a plant. The old smeltery at Pilot Bay was dismantled and such material and equipment as was available was transferred to the site of the new mill.

Mine Conditions

The general arrangement of the plant is such as to permit of increase of capacity at relatively small expense. In detail, the planning of the mill, which was designed by S. S. Fowler, general manager of the company, has not involved any radical departures from well established lines of ore dressing, although there have been introduced some minor innovations. As a corollary, the general scheme of development adopted for the mine has been such as to make practicable its exploitation at low cost. At the time construction of the mill was undertaken, it was estimated that about 300,000 tons of ore were available for stoping—about five years' supply for the mill.

This ore contains lead and zinc, with a small amount of silver. It lies above the adit level, so no hoisting or pumping will be necessary for several years. The distance the ore has to be hauled from the faces to the mill is not more than 1000 ft., and haulage is by mules. The only power machinery in use for the mine is a five-drill air compressor, driven by water conveyed three miles in a 16-in. spiral-riveted steel pipe and affording a static head of 725 feet.

Milling Process

The main mill building is 156x50 ft. and about 60 ft. high; other buildings include a magnetic-separator house and a machine shop. The following outline of the ore-dressing process will give an idea of the mill equipment: The ore is hauled in cars from the mine to the mill, where, after being weighed, it is dumped into a pocket which feeds a 20x10 Blake crusher, which crushes it to not larger than 4 in. in size. An incline belt conveyer takes it thence to a storage bin, capacity 150 tons, situated at the top and back part of the mill.

It is next fed automatically to a second Blake crusher, and then passes through three sets of cornish rolls which reduce it to ⅜ in. A 60-ft. bucket elevator then lifts it to the top of the mill, whence it goes to the trommels. The coarser material, passing through the 5- to 10-mm. screens, is taken to eight 2-compartment jigs, where the coarse lead is extracted. The middlings from the jigs is again passed through rolls and once more elevated to the top of the mill; thence it goes to the trommels and together with the fines from the 1- to 5-mm. screens, is treated in four double five-compartment Hartz jigs.

All the ore under 1 mm. and the zinc and lead middlings from the Hartz jigs go to a Ferraris ball mill and a Huntington mill for finer grinding. The pulp from these mills is elevated by two centrifugal pumps to the top of the mill, where it is discharged into a Callow dewatering tank. The thickened pulp is then passed over two Callow screens which separate the coarser from the finer part of it, the latter going to three Callow settling tanks. These Callow screens and tanks classify the pulp and distribute it to ten No. 5 Wilfley tables, which separate the lead, zinc and iron, the lead going to bins for shipment. The lead concentrate contains about 60 per cent. lead and some silver, and is shipped to the smeltery at Trail. During six months—July to December, 1908—the output was about 2220 tons of lead concentrates. As the proportion of ore to concentrate is about 8 to 1, the quantity of ore milled may be placed at, approximately, 18,000 tons.

"The ore contains about 30 per cent. pyrrhotite, which leaves the tables and finer jigs with the zinc blende and after being dewatered, is conveyed to a drying furnace, cooled and elevated to a magnetic separator installed in another building, 50x70 ft. The zinc separation plant was not, at the close of 1908, in full operation but it was expected to make a product of about 40 to 45 per cent. zinc. No arrangements had then been made for marketing the zinc concentrate, the lack of interest shown by buyers making it advisable to proceed slowly.

Zinc Separation

"The mill plant is run by four 50-h.p. Doble water-wheels, set up in the roof trusses and supplied with water from the system previously mentioned. The waste water from these wheels is used as wash water throughout the mill. Not only is the milling plant complete, but being located near the water's edge, it is consequently favorable to low operating costs. Besides the milling machinery already mentioned, there are machine shops equipped with power tools, etc., and an electric light and heating system, the latter including two 60-h.p. boilers which heat all the buildings in the camp, as well as providing an auxiliary power in case of a break-down in the water system.

The Flake Graphite Industry in the United States

By Frederick D. Chester*

Various efforts have been made during the last 10 or 15 years to organize and maintain the flake-graphite industry in the United States, but merely as an industry for the production of graphite in its crude form independent of the manufacture of graphite products it has rarely been a success. Today there are more abandoned mines and costly plants than those in operation, and the question might be asked, why does this condition of things exist?

Every enterprise which has ever started has been founded on hope, and large sums of money have been ventured by promoters and organizers who have had very little true idea of commercial facts as applied to graphite, and still less of the technical side of its milling operations. Thus where mistakes have been made it has frequently been at the start, due to errors of judgment, which in turn have been the result of inexperience. Experience is costly, and mistakes must be made before it is gained, and where this cost has to be met by a host of stockholders, the latter are liable to lose confidence too soon, and often on the very eve of success.

Milling of Graphite Ores not Reduced to a Science

It should be understood that the technology of graphite is as yet in a formative stage, and that there is no established system or scientific basis, such as applies to most of the mining industries, and for this reason operators are groping more or less in the dark. The industry is as yet too unimportant to attract the attention of the best experts in ore dressing, and it has been largely in the hands of local mechanics, who lack the proper scientific training and broad knowledge, so necessary to the working out of a difficult problem. The difficulties are still further increased by the variable charcteristics of the ores of different mines, making each problem in a measure a local one, so that while some mines which have had longer experience than others may have worked

*Manager and treasurer, Chester Graphite Company, Chester Springs, Penn.

out a satisfactory system of milling for their own type of ore, this experience may be inapplicable to someone else. But what has been most lacking has been the absence of fundamental principles to form a basis of guidance, resulting in too much haphazard empiricism and too many costly undertakings which were fundamentally wrong.

Commercial Features of Industry

Thus while success is in a large measure dependent on the direction given the technical side of the industry it is not altogether that, and the business side is equally important. It is largely a question of the difference between the cost of production and the market value of the product, and this balance is determined by a variety of conditions. If flake graphite were a staple product like copper, lead or silver, produced by established methods and salable at all times in the open market at the fixed market price, the sales end would be simplified, but it is a manufactured product, of variable quality and market value, and is subject to laws of competition, which are also unusually severe because American flake has as yet to win a secure place in the market. Even if graphite could be considered as a raw material, and could be sold on some uniform basis of price, as so much for each unit of carbon, the marketing of the product would be simplified, and it would be fairer both to the producer and the buyer. But no such system of determining values has ever had general application.

In general the cost of producing flake graphite is so high, and the price at which it is sold so low, that even under the most economic conditions the margin of profit is small. In many cases the cost of production has considerably exceeded the returns, and inevitable failure has eventually followed. Many ores are of too low a grade, or the expense of mining and milling them too high, to be profitable. Other ores are of such a character that the percentage of extraction under existing methods is unsatisfactory. These are weak points at the very start, which an experienced man should be able to see, before any money is spent on what is sure to be an unprofitable venture.

Grade of the Ore

Just what grade of ore can be handled with a profit depends on the expense of mining, cost of reduction, and its milling qualities. There are instances where ores yielding as low as 2 per cent. of graphitic carbon can be handled at a profit, but probably this approaches very close to the limit. By this is meant an actual yield in marketable graphite of 40 lb. of actual carbon to each ton of ore handled; it does not refer to the actual percentage of crude graphite in the ore. Graphite investors are commonly misled by assay reports. These assays are frequently made from selected samples, and even when an honest effort is made to obtain an average sample it is invariably a flattering one, and rarely represents the ore handled over a long period. For this reason there is only one method of getting at results of practical value, and that is to go by actual mill tests of a definite quantity of ore, determining the weight and actual amount of carbon in the resulting concentrates.

Notes on Economic Geology of the Cobalt Area

By Glenn Anderson*

In the Cobalt district as in all new fields, the occurrence of ore and its geologic relations to the rocks are of paramount importance to the miner as well as the investor. From the time of the discovery of Cobalt to the present day, various theories attempting to limit or define the ore occurrence have been advanced, many of which have been abandoned in the light of later discoveries. For an understanding of the conditions in this field, a brief description of the rocks is necessary, and the following is an excerpt from the report of Willet G. Miller. The rocks of the district, beginning with the lowest and underlying, comprise the following:

Keewatin—This series is an igneous complex consisting of metamorphosed igneous rocks.

Laurentian—Granite, intrusive into the Keewatin but not into the Huronian; great unconformity.

Lower Huronian—This series comprises conglomerate, breccia, quartzite and graywacke slates; unconformable.

Middle Huronian—Lorraine arkose, conglomerate and quartzite.

Diabase and Gabbro—These igneous rocks cut through the Keewatin, Lower Huronian, Middle Huronian and all other Pre-cambrian series in the field. The exact age is unknown; unconformable.

Niagara—Limestone and sandstone.

During the early days of mining in the district, the ore occurrence was thought to be limited to the Lower Huronian; later the diabase was admitted to fellowship as an orebearing rock, and more recently important discoveries have been made in the Keewatin. On looking over the area today, the most significant facts noticed are that practically all the ore occurrences of any importance are in or near the Keewatin, or rocks derived from it, viz., the Lower Huronian, and are also close to igneous contacts of either diabase or granite.

Granite-Keewatin contacts have not as yet been sufficiently explored to determine their economic importance. It is true that some good veins have been found in Keewatin near granite intrusions, but they are also near diabase contacts and the probabilities are that the ore is due to the latter intrusive. Likewise the central portion of large areas of a single rock such as Keewatin alone or diabase alone have not proved productive.

From the foregoing considerations, it would seem probable that the Keewatin or its derivatives, notably the Lower Huronian conglomerate, were the source of the valuable minerals and that the eruptive diabase furnished the necessary fracturing and heat for the formation and filling of the veins. It naturally follows that a contact between these two rocks would be the most favorable for productive veins.

*Mining engineer, Cobalt, Ont.

Dredging Troubles in California

Special Correspondence

The city trustees of Oroville, Cal., have been trying to prevent the Ophir Dredging Company from dredging its own land within the city limits. The outcome of this has been that the Ophir Dredge Company has obtained from the United States circuit court a temporary restraining order preventing the trustees from passing or enforcing an ordinance to prohibit the company from dredging its own land within the city limits. The company claims that its property within the town is in a "morass" not near any human habitation, and the dredging operations are of sanitary benefit to the town instead of a detriment. The Oroville trustees are also giving trouble to the Indiana Dredging Company. The company claims it is keeping within its contract with the city, having to November 1 to level its cobble piles. After that date a company must keep within ten days of the boat until the summer months come when they are allowed 30 days to follow behind the boat with the leveling operations. The old tailings piles are now nearly leveled.

At a recent meeting of the Anti-Débris Association a letter was received from parties who want to operate a mine on the Forest Hill, Placer county, and asking if the association would require them to build a dam. The attorneys wrote in response that the object of the association was to prevent injury to the rivers by débris from any source and that as far as dredge mining was concerned it would insist that such mining be conducted without depositing material in the rivers. In numerous cases where dredge mining was being conducted, the evidence before the association was that no injury was being done, and in other cases where injury was shown suits had been brought to enjoin operations.

The Anti-Débris Association is to adopt new tactics in the dredge-mining matter by getting land owners along the banks of the rivers to bring suits for damages against the dredging companies. So instead of injunction suits, litigation is to be begun in the names of individuals who allege damage where evidence will justify.

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The Copper Statistics for September

An unfavorable report for September was expected, but so large an increase in the stock was hardly looked for. The rate of production increased still further, exports advanced a little over August, but domestic deliveries fell off to a large extent. If we take a figure approximating the average of the domestic deliveries during the last three months, say 60,000,000 lb., we shall probably come near to measuring the present domestic consumption, which has revived strongly since the beginning of the year. This is very close to, if not actually in excess of, any previous rate and consequently there is no fault to be found with the copper-manufacturing industry, or any reason to say that this branch of trade lags behind iron and steel and the others that are now manifesting a feeling of buoyancy.

The trouble with copper is the over-production, which continues upon such an ever increasing scale that it is difficult for consumption to catch up with it. The reason for this over-production is the handsome profit that the principal concerns find even in the prices that have been realized during 1909. We see no reason to anticipate that so long as the present level of price prevails there will be anything else than a continuing increase in the rate of production. The idea that there will be a check because the first of the important mines now in development will not come in for a year yet is fallacious. While it is undeniable that the mines are primarily the source of production, a factor that is closer to the market is the smelting capacity, there being many mines that are able to furnish ore for increase in the latter as fast as it is provided. Thus, when mining was suspended by the Cumberland Ely a few months ago on account of the strike its share of the Steptoe smeltery was immediately utilized by Nevada Consolidated, and the output of Ely has been increasing right along as new furnaces have been added to the Steptoe works, an easy matter in the case of a plant designed for large expansion. Does anyone doubt that when the Tooele works begin operations in 1910 and take away a part of the present supply of Garfield the latter will fail to find use for its capacity thus relieved? It is in this gradual way that production always increases—when Miami, Ray Consolidated and the others begin they will also be gradual—and the only condition that may check it is a decline in the market that will cause more or less of the productive capacity to become unprofitable.

Indeed, the only condition that can lead to the advance in price that producers hope, or even sustain the present price, is a stride in consumption that will outstrip, or at least equal the production. We referred not long ago to the market being in a state of equilibrium, but that equilibrium has been artificial, depending upon the financing of copper loans and it has always been doubtful how long it could be maintained. Heretofore the undertaking has been comparatively easy through the cheapness of money, but the recent advance in interest rate and the cold water that has been thrown specifically upon copper speculation by the German banks have altered the situation.

The problem, in a nutshell, is: Will the holders of the accumulation of copper be able to carry it until consumers are ready to absorb it without making a sacrifice to hasten absorption? For this absorption we are bound to look largely to Europe. If American consumption has already attained 60,000,000 lb. per month it is unreasonable to anticipate a further large increase here in the immediate future, no matter how healthy is the state of business. The daily rate of production by the American refineries in January, 1909, was about 3,617,000 lb.; in September, 3,934,000. A mere maintenance of the present rate would correspond to an increase of 115,000,000 lb. in the production of a year as compared to the rate of only nine months previous. The situation does not encourage hopes for a lasting advance in the price for copper during the coming winter.

The Boston & Colorado Smelting Company

The decision of the directors of the Boston & Colorado Smelting Company to wind up the business and dissolve the company deserves some notice as the passing of an old and long a prosperous industry. The company was formed 44 years ago, in 1865, and two years later started its plant at Black Hawk, under the charge of Professor Nathaniel P. Hill. It remained at that place until 1878, when it was removed to the present site in Denver. The old plant was the first to treat successfully the pyritic ores of Colorado,

using copper as a base. For many years it paid dividends regularly on a steady and profitable business. During the last nine years, however, the company has had only four years of profit, and the losses of the other five years exceeded the profits of the four. Its refinery was destroyed by fire three years ago, and has never been rebuilt. So far as its current finances are concerned, it is out of debt, and the present time is considered a favorable one to close up its affairs, as a fair dividend can be made to the stockholders.

The result has not been brought about so much by direct competition as by the gradual narrowing of the field from which it has drawn the ores treated, and by changes in the ores still available which would require a remodeling of the plant, at an expenditure on which it was doubtful whether a profit could be earned. The plant has done good work in its day, but the day has passed, and the decision of the directors is probably a wise one.

California Oil Conditions

The petroleum operators in California have been much disturbed by recent rumors and occurrences. The first was a report that the Associated Oil Company was about to retire from active participation in the oil business as a result of the competition of the Union independents, and that an order for certain new pipe lines had been countermanded; this is emphatically denied by the Associated company. Instead of restricting its activities the company is about to enlarge them. It now markets over half the oil products of the State and is about to add to its pipe lines. The new line from Coalinga to Port Costa will be finished by the first of the year and the 72-mile line from McKittrick to Coalinga will be completed a little later.

The announcement that the United States Land department is to withdraw from entry thousands of acres of oil lands in Kern and Fresno counties has brought California oil men up in arms. This is part of the Government plan of conservation of resources and is intended to prevent overproduction and waste of oil fuels. But the men who operate and deal in oil and oil lands consider this a severe blow to the industry, and do not see why they should conserve for future generations oil that is needed now. This move on the part of the Government will doubtless restrict prospecting new ground to a large extent because it is not yet clear what disposition is finally to be made of the lands. They are merely to be withdrawn from entry for the present and until Congress takes some definite action with regard to future proceedings. Meantime those operating in oil lands are rather at sea and not sure of what course to follow.

Notwithstanding these drawbacks, new prospecting continues. A company has been organized to bore deep for oil in the Half Moon bay region of San Mateo county where formerly many attempts were made to find oil in paying quantities. Such oil as this section has yielded ranges from 45 to 54 deg. gravity, and carries about 85 per cent. of illuminants with little asphalt in the residues. It is now proposed to bore much deeper than any wells heretofore bored and to get through the broken formation.

Death Rate in Transvaal Mines

In response to a question recently put in the British Parliament, the colonial secretary submitted a return showing the number of men employed in the Transvaal mines during the quarter ended March 31 last, and the average yearly death rate per 1000 men for the same period. The figures are given in the following table:

	No. Employed.		
	1907.	1908.	1909.
Whites	19,350	19,193	21,814
Chinese	53,738	28,797	10,527
Negroes	130,351	160,696	196,674
Total	203,439	208,686	229,015

	Dheats per 1000 per Year.		
	1907.	1908.	1909.
Whites	20.05	19.59	18.34
Chinese	16.38	15.70	15.96
Negroes	31.36	30.62	35.41
Total	27.94	25.60	32.89

The death rate among the white employees, while not very high, is not a low one, considering that the white men in the mines are mostly of the more favored class, holding superior positions. The Chinese death rate is the lowest, and speaks rather well for the condition of that class. It must be remembered, of course, that the Chinese brought over to the Transvaal were picked men, selected for their good physical condition and healthy appearance.

The high death rate is among the negroes; this year it was very nearly twice that among the whites, and more than twice that of the Chinese. Some of the high death rate is said to have been due to the extension of recruiting which has brought in many from the districts up near the equator, the men from which often suffer from disease when brought to the high tablelands of the Transvaal; some is also due to the pressure for men, which has led to some carelessness in accepting them. The negro, as a rule, does not stand exposure to cold and climatic changes as well as a European. Moreover it is difficult to enforce sanitary rules among them, and perhaps the effort is not always strenuously made. Pulmonary complaints seem to be the chief cause of the high death rate.

In the Transvaal a great body of ignorant laborers is employed under conditions which, in some respects, approximate the slave labor of former times in South America. Modern opinion and knowledge have materially bettered those conditions, and human life is no longer a factor entirely disregarded. Nevertheless, there are some serious problems to be solved there, and the high death rate seems to be one of them.

The Selection of a Mill Site

There is a natural desire to build the mill as near to the mouth of the shaft as possible for obvious reasons. In connection with many kinds of ore deposits there was no danger in this, and even today there might be no hesitation in planting a mill near the outcrop of an ore deposit corresponding to the old idea of a true fissure vein. Unless, however, a substantially correct understanding of the character of the ore deposit is possessed, it is possible that a mill erected too near the mine will prove sooner or later to be over an unsuspected orebody that it will be desired to extract.

This has been the case recently at several mines in the newer camps of Nevada. Indeed, only a few weeks ago the cyanide tanks of the Combination mill at Goldfield caved into the mine, the mill being practically wrecked. Of course, if the builders of the mill had thought that mining would ever be done under their foundations they would have selected another site. Such experiences teach simply that it is inadvisable to build too near the mine unless we can be sure of the ground.

The Coal and Phosphate Lands

Richard A. Ballinger, secretary of the interior, has made the following statement:

The disposition of the phosphate lands of the Rocky Mountain States presents emergencies calling for legislation. All the known areas of phosphate lands in the public domain are now under temporary reservation, awaiting Congressional action. Common prudence demands that this fertilizer be disposed of with such restrictions as will require its domestic use so far as possible in the renewal of the fertility of the American farm rather than to permit of its exportation.

Respecting coal lands, since 1906 no coal-land entries have been permitted to be made in Alaska, pending requests upon Congress for legislation to prevent the monopolization of the vast fields of this valuable deposit lying in this territory, and to secure authority for permanent reservation for naval purposes.

Too much cannot be said in favor of legislation which will prevent the absorption of valuable coal deposits by private interests with the design of monopolization.

Philadelphia & Reading Coal and Iron Company

This company owns, leases and controls an extensive estate in the anthracite region of Pennsylvania. It is controlled by the Reading Company, which also holds the stock of the Philadelphia & Reading Railroad Company. The report for the year ended June 30, 1909, gives the fixed liabilities as follows: Stock, $8,000,000; collateral bonds, $1,200,000; due Reading Company, $74,800,255; the last-named amount representing advances made.

The anthracite statement for the year is as follows, in long tons:

	1907-'08.	1908-'09.		Changes.
Coal mined	10,218,392	9,283,961	D.	934,431
Coal purchased	1,083,682	955,620	D.	128,062
Total	11,302,074	10,239,581	D.	1,062,493
Coal sold	10,992,976	10,076,210	D.	916,766
Added to stock	309,098	163,371	D.	145,727

The total production of anthracite from lands owned, leased and controlled by the company in 1908-9 was 10,773,306 tons, 1,489,345 tons having been mined by tenants. The total is a decrease of 1,140,848 tons, or 9.6 per cent., from the previous year. The cost of coal mined and purchased was 7.6c. per ton higher than in the previous year; the price realized was 0.9c. per ton higher, making a decrease of 6.7c. per ton in the profit. The decrease in coal sold was 8.3 per cent.; in coal mined and bought, 9.4 per cent.

The income account for the year is as follows, in condensed form, averages being calculated on the tonnage of coal sold:

	Total.	Per Ton.
Gross earnings	$34,792,694	$3.45
Coal added to stock	478,868	0.05
Total	$35,271,562	$3.50
Mining and purchase of coal	$21,635,365	$2.15
Transportation of coal	9,080,328	0.90
Selling and general expenses	1,809,043	0.18
Total expenses	$32,524,736	$3.23
Net earnings	$2,746,826	$0.27
Depletion of coal land funds	$465,768	.....
Fixed charges and taxes	106,876	.....
Colliery improvements	1,172,205	.....
Interest on Reading Co. loans	935,003	.....
Total charges	$2,679,852	.....
Surplus for the year	$66,974	.....

Gross earnings include $33,411,277 for sales of anthracite; $909,810 sales of bituminous coal; $471,608 rents, royalties and miscellaneous. Mining coal includes $18,091,769 for mining and repairs of collieries; $2,111,246 for anthracite bought; $838,169 for bituminous coal bought; $504,182 royalties on leased collieries. Coal added to stock is credited at $2.93 per ton. The apparent profit on bituminous coal was $71,640.

The expenses last year were divided as follows: Cost of coal at mines, 66.5 per cent.; transportation, 27.9; selling and general, 5.6 per cent. The total expenses were 92.2 per cent. of gross earnings.

As compared with the previous year the gross receipts decreased $3,943,786; the expenses, $3,098,241; and the net earnings $845,545. The decrease in coal sales was the result of a comparatively mild winter and of light sales of steam coal to manufacturers.

Depletion of coal lands fund, to which 5c. per ton mined is credited, amounted to $1,990,852 at the close of the year, including the year's contribution and interest. Of this amount $1,497,168 has been invested in coal lands and improvements, and $300,000 in securities, leaving $193,684 in cash.

The employees' beneficial fund shows receipts of $159,084 from 30,855 contributors and $4400 from interest. The total of 4373 benefits paid was $153,677. The balance of $9807, with $33,539 brought forward from previous year, left $43,346 on hand at the close of the year.

The statement of the Philadelphia & Reading Railroad gives the following figures for coal traffic:

	1907-8.	1908-9.		Changes.
Anthracite	13,537,464	11,586,840	D.	1,950,624
Bituminous	10,816,439	10,574,314	D.	242,125
Total moved	24,353,903	22,161,154	D.	2,192,749
Ton-miles	2,776,062,041	2,561,567,593	D.	214,494,448
Av. haul, miles	114	115.5	I.	1.5
Earnings from coal	$18,577,272	$17,698,227	D.	$879,045
Av. per ton-mile	0.669c.	0.691c.	I.	0.022c.

The average haul is increased and the average receipt per ton-mile decreased by the large proportion of bituminous coal carried. Coal earnings were 42.9 per cent. of the total receipts of the road.

Peat Beds in Indiana

The extensive peat deposits in northern and northeastern Indiana are beginning to attract attention. Within the last year the experts of the United States Geological Survey investigated the deposits of this fuel and their investigation leads them to believe that there is great value in these beds. Charles A. Davis, of the Survey, who has charge of the peat investigations, declares that there are possibilities in utilizing peat for fuel, but he realizes, he says, that these possibilities may not be generally appreciated until after the supply of coal and other mineral fuels are gone.

He calls attention to the fact that at least 10,000,000 tons of peat are prepared annually in other countries for use as fuel by various processes, and that smaller quantities are manufactured into bedding for stock, into packing materials, into fertilizing filler, into powder or mull for disinfecting and other sanitary purposes and into a variety of articles of importance.

Mr. Davis says the primary use of peat is as a fuel for domestic purposes—for cooking and heating in private houses. When properly dried it is particularly suited to such purposes. It makes a good hot fire, burns with a long, clear flame and makes but a small amount of ashes and no clinkers. Mr. Davis further stated that peat charcoal and peat coke are being manufactured in considerable and increasing quantities in Germany and Russia, where these products are used instead of wood charcoal in iron manufacture and other metallurgical processes, including copper refining and steel making.

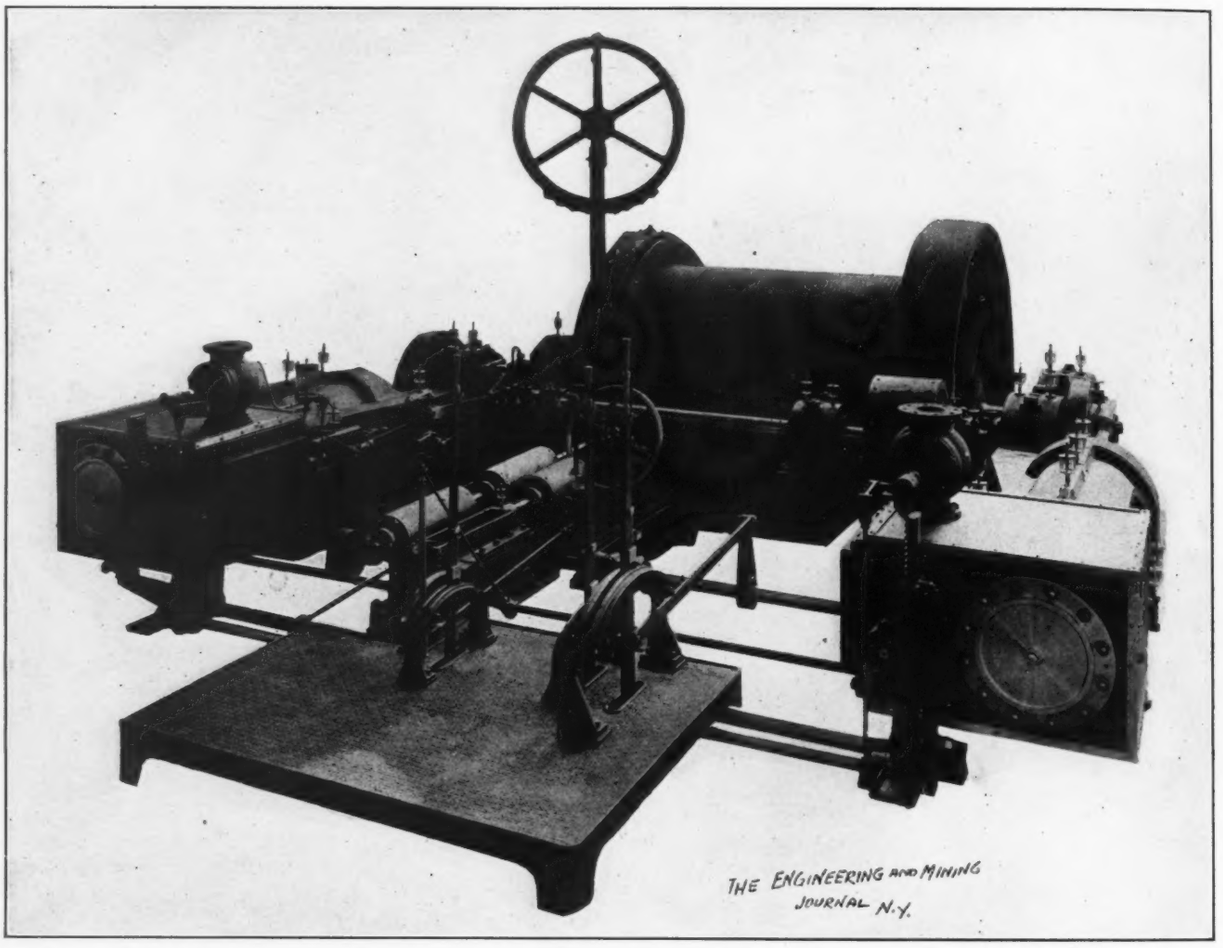
In discussing the possibilities for developing the peatfields of Indiana, he said a successful plant could be installed for about $160,000. There is at present a small plant in operation at Garrett, Indiana, in the heart of the peat-deposit territory. This plant is making mosslitter and mull.

Peat makes good paving blocks and is said to resist wear better than some materials now in use. Mr. Davis expresses surprise that its use for paving material and other uses named has not attracted the attention of the manufacturers in Indiana. He predicts that the peat deposits in Indiana will soon be developed into a valuable industry and what has long been deemed a worthless material will prove to be a valuable commodity.

The under secretary for mines states (*Report* of the Department of Mines, Queensland, for the year 1908) that the death rate per 1000 in Queensland during 1908 was: In metalliferous mines, 2.1; in coal mines, 1.79; in all mines, mills and reduction works, 1.61. The higher rate in metal mines is due to two serious accidents which occurred at Mt. Morgan.

New Type of Hoisting Engine

The Cleveland-Cliffs Iron Company has recently installed at its Lake shaft, near Ishpeming, Mich., a hoisting engine which embodies some unusual features. This hoist consists of a 6x6-ft. cylindrical drum, keyed to the shaft and driven through a gear and pinion by two 14x18-in. slide-valve reversing engines. The drum carries two 1¼-in. steel ropes, 850 ft. long, and hoists in balance from two compartments of the shaft. It is capable of a net load of nearly six tons, which may be hoisted at from 720 to 860 ft. per min., depending on the engine speed which varies from 150 to 180 r.p.m. Steam is furnished at 150-lb. pressure.



SULLIVAN HOIST AT LAKE SHAFT OF CLEVELAND CLIFFS IRON COMPANY

This hoist differs from other second-motion, slide-valve plants in its steam economy, which is estimated to be equivalent to that of a Corliss hoisting engine, designed for the same service. This unusual efficiency is gained by automatic regulation of the point of cut-off of the slide valves.

It may be asked: "Why is not the Meyer cut-off, with handwheel adjustment, suitable for hoisting engines?" To adjust the cut-off by hand in this instance is out of the question, since it is necessary for the engines to take steam the full length of the stroke, in starting the load; when the load is fully underway, the cut-off must be set in its shortest position. The cut-off must be lengthened again at the end of the hoist for the next load, and this operation repeated each trip. It is evident that no engineer has time to operate the screws between trips, nor would it be possible for him to set the cut-off at its most economical point each time, owing to variations in steam pressure and load.

Sullivan Automatic Device

The objection to using Corliss engines on geared plants, and thus gaining the desired economy, is that the Corliss valve gear and cut-off cannot be operated above a certain speed, so that the cylinders must be built with such a long stroke as to render the plant unduly expensive.

The device employed for doing this work automatically does not in any way limit the speed at which the engines may be run, thus permitting the engine of the most economical size and speed to be selected for a given duty, yet at the same time, it is possible to control the steam distribution as closely as in a Corliss engine, instead of wasting fuel by carrying steam the whole length of the stroke, as heretofore customary in slide-valve engines.

This invention, therefore, renders available a type of hoisting engine long sought by mine operators, one having moderate capacity and speed, with high steam efficiency and obtainable at a price well within ordinary means. Credit for this new regulating device is due the engineers of the Suilivan Machinery Company, who have employed an entirely new method for controlling the cut-off of the Meyer slide valves.

A double valve is used, as in the case of engines in which the steam distribution is controlled by hand adjustment. When starting the load, steam is admitted to the cylinders for the entire stroke. When the acceleration period is completed, the Meyer cut-off is automatically set at its shortest position in the manner shown in the accompanying drawing.

Details of Operation

When the throttle-valve hand lever *A* is thrown, the main throttles are opened

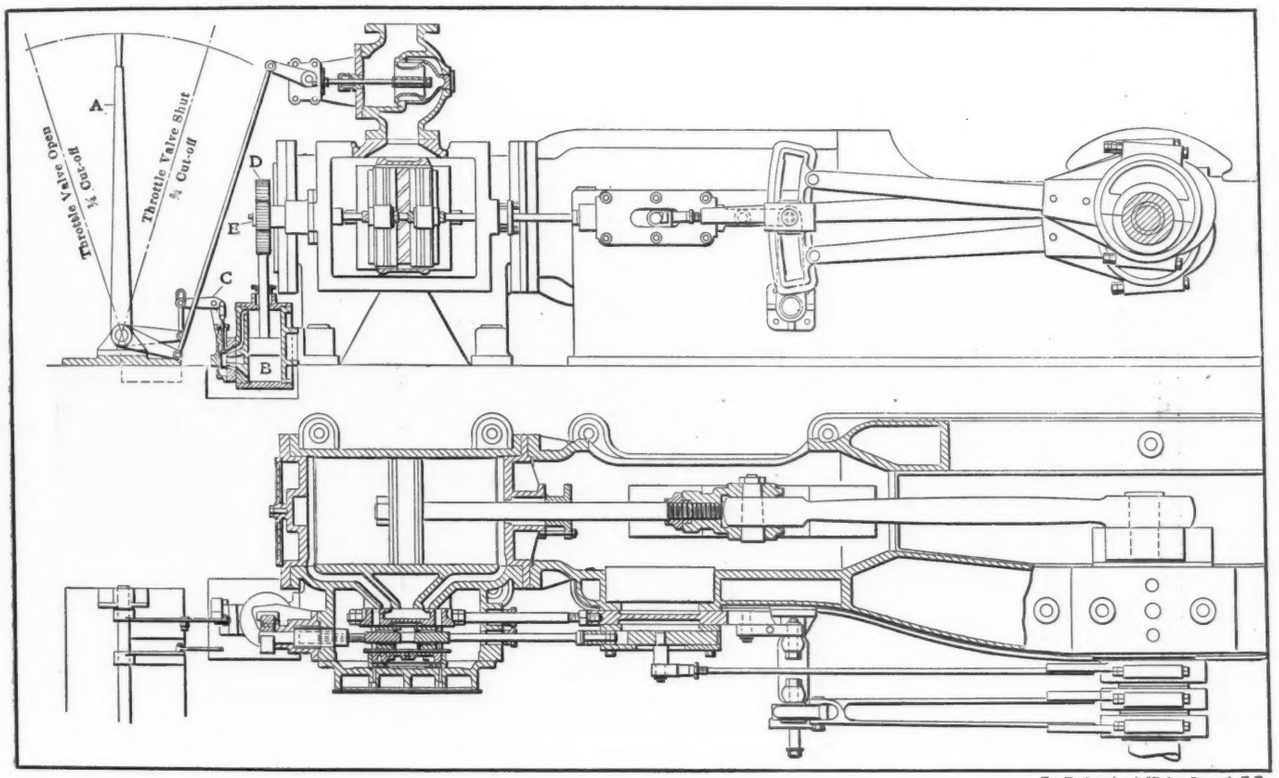
by the first two or three inches of the movement, admitting steam to start the load. As the lever is pulled back, it permits steam to enter cylinder *B*, through the valve mechanism *C*. The piston rod of this cylinder ends in a vertical rack *D*, which engages a horizontal pinion *E*, at the outer end of the spindle of the Meyer valve gear. When the steam enters cylinder *B*, by the movement of the throttle lever, the action of the rack and pinion automatically places the steam valves in the position of shortest cut-off. At the end of the trip, the reversal of the lever to close the main throttles admits steam to the opposite side of the piston in cylinder *B*, and the cut-off is restored to its first position, to start the load from the bottom.

a horizontal position. This enables the cut-off of both cylinders to be handled by one cylinder. The racks, in this instance, are operated by bell cranks.

The drum is fitted with a heavy band brake, steam operated, with a wheel for setting the brake by hand at any point, for inspection or repairs when the plant is not under steam. The gear and pinion are made of cast steel with cut teeth, the teeth being of such a shape that several of them are in mesh at once, thus rendering the action of the hoist smooth and quiet, even while lowering unbalanced. The engines are mounted on heavy-duty frames, the pillow-block section and guide section being cast in one piece. The bottom of these frames form inclosed boxes, to prevent oil from touching the foundations.

Coalinga Pipe Line, California

The Associated Pipe Line Company of San Francisco is installing 13 direct-acting Jeanesville pumps to transfer oil a distance of 175 miles. The pumps are triple expansion and the diameter of each steam cylinder is 18, 28 and 48 in., respectively, with a 3-ft. stroke. The oil plunger is 9½ in. in diameter, and works under a pressure of 800 lb. per sq.in. The steam will be superheated and condensers used, so that the amount of steam necessary to operate the pumps will be about one-half that used on the Bakersfield line, which has a like capacity—18,000 to 22,000 bbl. per day. The pumps will be installed at intervals along the line, the longest distance between any two stations being 24



The Engineering & Mining Journal, N.Y.

SECTIONAL PLAN AND ELEVATION OF SULLIVAN HOIST AT LAKE SHAFT OF CLEVELAND-CLIFFS IRON COMPANY

It will be seen from the above description that the apparatus employed is simple and its action positive. It is entirely automatic, requiring no especial effort or attention on the part of the engineer, after the eccentrics have been set to secure the most economical operation possible with the prevailing service factors of load and steam pressure. The slide valves are operated by separate eccentrics, with the usual link motion, the third eccentric being for the cut-off. The range of the cut-off is from three-quarters to one-quarter at the latest setting, and from four-tenths to one-tenth at the earliest.

General Features

It will be noted that the automatic cut-off engine shown in the halftone is in

Hoists of this pattern are built in several stock sizes, and all parts are interchangeable, enabling them to be made and sold at a smaller cost than is possible when each plant is of special design. It is expected that they will be employed extensively in mines where the requirements of depth, speed and load do not warrant the purchase of a first-motion Corliss plant, but where economy of fuel is nevertheless a factor.

The combined output of the 50 chrome iron-ore mines operating in the Ural, as estimated by U. S. Consul J. W. Ragsdale of St. Petersburg, is about 1,600,000 poods (26,210 metric tons) per annum. The ore is quoted at 20@25 copecks per pood (10@13c. per 36 lb.) at Ekaterinburg.

miles. The line starts at Coalinga and connects with the Bakersfield line via Mendota. The pipe is 8 in. in diameter, 5/16 in. thick, and is to work under a pressure of 800 lb. per square inch.

At each station the oil is pumped into a large tank where the oil and water are separated. The oil is drawn into a second tank from which it is taken by the next pump, and delivered to the succeeding station. As the oil enters the suction pipe it passes through an exhaust-steam heater to raise the temperature to about 90 deg. Each pump weighs 80 tons and occupies a ground space of 14 ft. 6 in. by 42 ft. The high-pressure steam cylinder works at 170 lb. per sq. in. The pumps are being shipped from the factory at the rate of one per week.

Details of Practical Mining

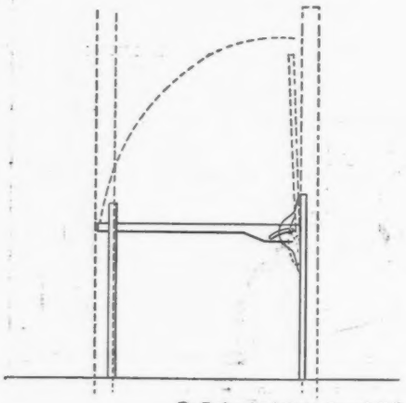
Notes of Interest to the Operators of Small Mines as Well as of Large Mines. The Things That Have to Be Done in Everyday Mining

REPORTS FROM EXPERIENCE

Readers of the JOURNAL are invited to contribute to this department. Articles should be brief, thoroughly practical, and preferably illustrated by drawings or sketches. Our draftsmen will prepare properly any kind of a pencil sketch that is intelligible. Something that is an old story in one district may be quite unknown in another. Articles accepted and published are suitably paid for.

Gate Bar at Shafts

The accompanying illustration shows a bar that is easily made, and that will remain open when so desired. The bar may be 1½-in. pipe or a ¾x2-in. piece of iron. The essential part is that the hinged end be flattened and a 3-in. slot

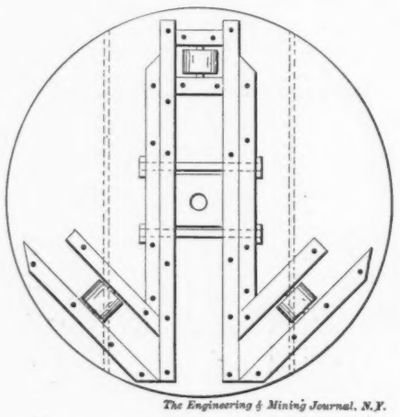


GATE BAR AT SHAFT

cut as shown, through which a ¾-in. bolt will pass. When the bar is lifted, it slides back on the bolt, thus giving sufficient leverage to hold it upright. When closing the bar is lifted 3 in. and then turned down in place.

A Homemade Turntable

The accompanying illustration gives details of a turntable which any carpenter can easily make. It is 4 ft. in diameter and suitable for 24-in. gage track. The floor is of 2-in. planks. The support in the center is 7 in. square, through which a hole is bored for a 2-in. pipe. A band is bolted around the pivot block to prevent it from splitting. The sills are made of two 2x8-in. planks securely bolted together on each side of the pivot with ¾-in. bolts. The planks are 8 in. high in the center, and are chamfered at the end to about 3½ in. high. The



HOMEFASHIONED TURNTABLE

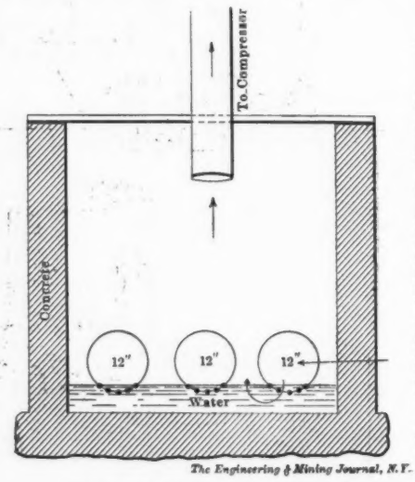
rollers may be made of 4-in. pipe cut in 4-in. sections with a wood center driven in, through which a 1-in. hole is bored for a spindle. A 4-in. coupling will also serve the same purpose.

Acetylene Lamps

The Republic Iron Company has been using acetylene lamps in the mines for about one year. When the lamps were first introduced, they were sold to the miners at the same price as the ordinary lamps in which "sunshine" was used. After all the men had been supplied, the additional lamps were charged out at the rate of 75c. each, which is actual cost. With ordinary care one lamp will last six months. They require ½ lb. of carbide per day. This amount is handed out to the miner at the beginning of each shift, at which time he returns an empty can which is filled during the day and thus is ready for the next morning. Each lamp burns about two hours before it is necessary to recharge. The lamp is small and light, and is worn on the hat, the same as the ordinary oil lamp. The great advantage in the use of these lamps is cleanliness. There is no oil and no soot. They also give a better light and do not foul the air to such an extent as some other illuminants. The actual cost of using these lamps is about one-fourth that of candles, and one-half as much as "sunshine" or oil.

Washing Air for Compressors

The site of the compressor plant of the Penn Iron Mining Company is on a sandy bottom-land at the base of a hill that furnishes more or less sand during windy weather. As the result of these conditions sand would get into the compressors and cause trouble. A scheme for washing the air was resorted to which is shown in the accompanying sketch. A concrete box 5½ ft. wide, 5 ft. high and 16 ft. long was constructed. In



CONCRETE BOX FOR WASHING AIR

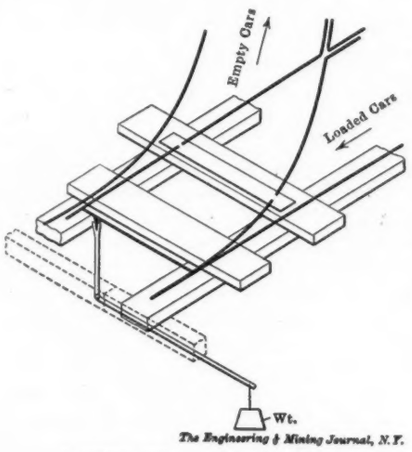
the bottom of the box three 12-in. cast iron pipes were laid, extending the full length of the box. The pipe is supported by the end walls. The lower side of the pipe is perforated with the sufficient number of ½-in. holes to allow the air to enter. Water is placed in the box so as to cover the perforations in the pipe 1 in. deep. This, however, is adjustable and can be arranged for any depth necessary.

The box is covered with plank so that all the air must enter through the water-covered holes in the 12-in. pipe. The intake pipe from the compressor enters from the top of the box but does not extend to the water, and therefore does not take up much suspended water. However, the air does absorb a certain amount of moisture as it passes through the water. To reduce the amount of

moisture in the air, the air is cooled as it passes from the first stage of the compressor to the second stage by passing through 150 ft. of water-cooled pipes. A small perforated water pipe is placed above the air pipe to furnish water for cooling the air. There is a trap between the two stages of compression to catch the condensed water. L. F. Armstrong, mechanical engineer for the company, designed this apparatus.

An Automatic Switch

The accompanying illustration shows a switch operated by gravity instead of a spring. It can be easily used on trestles where there is space beneath the tracks. It consists simply of the ordinary two short rails fastened together as in the case of a spring switch. Beneath the connecting bar is a small lug which is engaged by an L-shaped lever. One arm of the lever is 2 ft. long, and the other 1 ft. At the angle point it is fastened

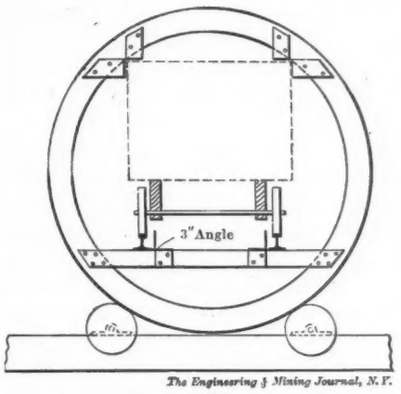


GRAVITY SWITCH FOR ORE CARS

to a post or beam. The short arm has a wide opening which engages the lug on the bar above, and by means of a small weight on the end of the lever it throws the switch. It works satisfactorily, and has been in use by the Cleveland-Cliffs Iron Company for a number of years. It is arranged so that it is opened by the loaded cars and then closes, thus throwing the empty cars on another track upon their return.

Revolving Tipple

The revolving tipple for mine cars has the advantage that it simplifies the construction of the car. It saves a large number of castings and no hinges are necessary. The car can be made much lighter on this account—simply a sheet-iron box mounted upon wheels. The tipple may be made any size, but a convenient one for a car that one man can handle is 50 in. in diameter and 6 ft. long. The two rings are made of ¾x4-in. steel bars, held together by 3-in. angle irons at the top which engage the top of the car. The ends of the angle iron are split and bent back on the ring and fastened.



REVOLVING TIPPLE FOR ORE CARS

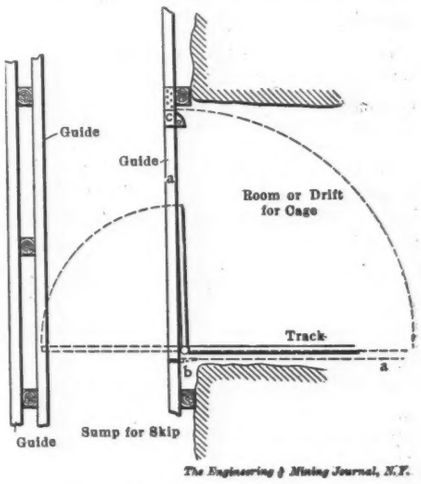
Rails are fastened in the bottom of the ring as shown in the accompanying sketch. The track is 24-in. gage and the entire frame is mounted upon four ordinary car wheels, two at each end. With the loaded cars the center of gravity is above the center of the circle and the car is practically self dumping. When the car has been emptied, the center of gravity is below the center of the circle and the car again returns to its original position. The car will dump easier and quicker than does the end type when operated by hand.

Catenary Hoisting Cable

There is an unusual installation of a hoisting cable at the Republic mine, Republic, Mich. In order to utilize a central power plant, it became necessary to have a cable operate across a small lake a distance of 1800 ft. before the headframe of the shaft could be reached. The shaft is about 800 ft. deep and is inclined at an angle of 70 degrees. In constructing the cable across the lake, the towers for supporting the cable would be very high if an attempt had been made to keep the cable in a straight line from the drum to the shaft. A catenary curve between the two places was figured out on the basis of the breaking load of the cable. Towers were erected at intervals of 100 ft. entirely across the lake, the one near the center being only 10 or 12 ft. above the level of the lake. The catenary is so flat that the cable has no tendency to lift off the pulleys and at the same time the friction on the pulleys is less than it would be if the cable were worked in a straight line. A large saving also resulted from the construction of smaller towers.

Device for Changing from Skip to Cage in Shafts

At the Dunn mine, Crystal Falls, Mich., the main hoisting shaft is large enough for only two skips, running in balance, and a manway for ladders and pipes. In hoisting ore it is not practicable to have safety appliances on the skip, for in the rapid descent of the skip the rope slackens and allows the dogs to injure the runners or guides. Furthermore, it is not safe to hoist men on the skips without a safety device, and since there was no room for a cage compartment, it became necessary to provide a safe way in which to hoist men. An ordinary cage is used for this purpose, having its full complement of safety devices. The shaft is about 1400



ARRANGEMENT FOR INTERCHANGING SKIP AND CAGE

ft. deep. The arrangements for replacing the skip with the cage were made at the lower level. A drift 12 to 15 ft. long was cut in the wall rock at one side of the shaft and a track put down. A truck is operated on this track for the transfer of the cage from the mine to the shaft. The skip is lowered into the sump and the cable detached. The guide *a* (hinged at *b*) is opened, and the track let down across the shaft. The cage which is on the truck is then run into the shaft and the cable attached. The skip in the other compartment is run in balance with the cage. After the men are all hoisted or lowered, as the case may be, the cage is placed on the truck and run out to the side of the shaft, where it remains until a change of shift. The sleeve *c* is made of ¼- or ⅜-in. sheet steel, and is countersunk in the guide to make a smooth joint. The movable portion of the guide *a* is held in place by a pin inserted in the hole shown in the drawing.

Personal

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

An assistant editor is required for THE MINERAL INDUSTRY. The character of this well-known work indicates the qualifications that are necessary. Applicants are requested to address this office.

F. F. Sharpless is examining mines in the vicinity of Denver, Colorado.

B. W. Traylor, vice-president Traylor Engineering Company, is at Parral, Mexico.

Charles Herzig sailed from London, Oct. 2, on his way to Nicaragua, by way of New York.

S. W. Traylor, president Traylor Engineering Company, has returned to New York from a recent trip to Cobalt, Ontario.

H. V. Croll has been appointed general sales manager of the Traylor Engineering Company, with office at Allentown, Pennsylvania.

George L. McKenzie, of Tucson, Ariz., has been visiting mines in northern Washington and neighboring parts of British Columbia.

Ernest Levy, manager of the mines at Rossland, B. C., of Le Roi No. 2, Ltd., lately spent several days at Spokane, Washington.

H. S. Chapman has been appointed manager of the Coalition-Queen-National mill at Rawhide, Nev., in place of L. M. King, resigned.

C. C. Williams, formerly with the Shannon Copper Company, is now with the Arizona Commercial Company at Globe, Arizona.

S. F. L. Dean has been appointed general manager of the Columbus & Hocking Coal and Iron Company, with office at Columbus, Ohio.

J. W. Bryant, mining engineer for the Tyee Copper Company, has returned to Victoria, B. C., from an extended visit to southeast Alaska.

P. E. Van Saun, chief engineer of the Mill and Smelter Engineering Company, of New York, has left for Nevada on business for his company.

M. E. Purcell, superintendent of the Centre Star group of mines, Rossland, B. C., lately visited several mining camps in the northwestern States.

R. W. Brock, director of the Geological Survey of Canada, was in British Columbia recently on his return from Yukon Territory and Alaska.

C. R. Wilson, recently with the Jones & Adams Company, of Chicago, has been appointed manager of the Uniontown, Penn., office of the Moreland Coke Company.

Jules Labarthe, manager of the Consolidated Mining and Smelting Company of Canada's plant at Trail, B. C., has been spending a vacation at Seattle, Washington.

Francis T. Havard, of Helena, Mont., has been appointed assistant professor of mining and metallurgy in the University of Wisconsin, at Madison, Wis. He is well known as an expert metallurgist.

Herbert Carmichael, assistant provincial mineralogist for British Columbia, has returned to Victoria from an official inspection of a number of mines in the Portland canal district, northern British Columbia.

C. O. Schmitt, of the Consolidated Goldfields of South Africa, Ltd., has sailed for England this week, after a short visit in the United States. His address will be at the Rand Club, Johannesburg, Transvaal.

Julius Lewisohn and J. Parke Channing, of New York, have been visiting the mines of the British Columbia Copper Company and the New Dominion Copper Company, in the Boundary district of British Columbia.

P. S. Elwell has been appointed general manager of the Pittsburg Coal Company, in place of C. P. White, resigned. T. F. Blackmar succeeds Mr. Elwell as secretary of the company, and J. P. Eaton as treasurer.

R. W. Coulthard, of Toronto, Ont., formerly with the Crow's Nest Pass Coal Company at Fernie, B. C., has been appointed manager of the West Canadian Collieries, Ltd., with headquarters at Blairmore, Alberta.

W. Fleet Robertson, provincial mineralogist for British Columbia, was among the Canadian members of the American Institute of Mining Engineers who attended the autumn meeting held in Spokane, Wash., at the close of September.

W. Weston, with Arthur Lakes, Jr., as assistant, made an examination of the Waldorf group of mines on McClelland mountain, above Silver Plume, Colo., recently, for E. J. Wilcox, president and manager of the Waldorf Consolidated Mining Company.

Obituary

Parker Price, who died suddenly at Pottsville, Penn., Oct. 7, aged 60 years, was a life-long resident of the anthracite country. He was at one time an independent operator, but later became connected with the Lehigh Valley Coal Company; for over 10 years past he had been with the Philadelphia & Reading Coal and Iron Company.

Societies and Technical Schools

American Society of Mechanical Engineers—Meetings of this society are to be held during the month of October as follows: In New York, on Tuesday, Oct. 12, in the Engineering Societies building; in St. Louis, jointly with the Engineers' Club of St. Louis, on Saturday, Oct. 16; in Boston, on Wednesday, Oct. 20, jointly with the Boston Society of Civil Engineers

Quebec Technical School, Montreal—On Oct. 4 the corner stone of the new technical school which is being constructed by the provincial government of Quebec on Sherbrooke street, Montreal, was formally laid by the Canadian premier, Sir Wilfrid Laurier, in the presence of a large and distinguished audience. In the course of his speech the premier enlarged on the vital necessity for technical education in view of modern industrial development more especially in connection with electric power. Other speakers were Sir Lomer Gouin, premier of Quebec, F. D. Monk, M. P., and Bishop Farthing. The school will occupy an entire block and will cost $1,000,000 in all.

American Institute of Chemical Engineers—The second annual meeting of the institute will be held in Philadelphia on Dec. 8-10, 1909. While the headquarters will be in that city, excursions are being arranged to some of the very interesting centers of industry in its vicinity. Early announcement of details will be made. A number of most important papers have been promised, and no doubt many more will be secured. Members are urged to advise the secretary immediately of subjects which are to be presented. The committee on meetings is desirous of having copy of papers early in order to secure a discussion by members interested. If possible, printed copies of papers will be ready in advance.

American Electrochemical Society—The autumn meeting will be held in New York City, Oct. 28-30. The convention will be opened by a meeting at the Chemists' Club on the afternoon of Oct. 28. A number of papers will be presented and discussed, and Prof. Edgar F. Smith, of the University of Pennsylvania, will deliver a lecture on recent developments in electro-analysis. Oct. 29 will be devoted to a visit to Bayonne, N. J., where a number of plants will be visited, including those of the Standard Oil Company, the National Sulphur Company, the Pacific Coast Borax Company, and others. On Oct. 30, two sessions will be held at Columbia University for the reading and discussion of papers. The social features of the meeting will include a banquet on the evening of Oct. 29, and a smoker at the Chemists' Club on Oct. 30. Dr. Leo H. Baekeland is president of this society, and Dr. J. W. Richards, Lehigh University, South Bethlehem, Penn., is secretary.

Special Correspondence from Mining Centers

News of the Industry Reported by Special Representatives at Butte, Denver, Salt Lake City, Goldfield, Cobalt and Toronto

REVIEWS OF IMPORTANT EVENTS

San Francisco

Oct. 7—The closing down of the property of the Lightner Mining Company at Angels, is quite a severe blow to that district, and will have its effect also on the total bullion output of California, since the mine has been a large producer for nine years, and has been paying dividends to a number of stockholders. The shaft is in such a shape that it is considered unsafe to longer operate the mine under present conditions. The surface ground on the footwall is settling so fast that it is impossible to maintain the hoisting machinery, boilers and compressors on their present foundations. Indeed, it has been necessary for some time to keep the machinery in line by "jacks" which have been in constant use. The plant has now been closed down until the company can secure ground for a new shaft and machinery. The property is not to be abandoned altogether, as there is over 500,000 tons of good ore in sight above the 600 level. It is noteworthy in connection with this property that for a long time it was unprofitable, and finally the stockholders, principally residents of Stockton, decided to make a change in management and put Alex Chalmers in charge. He was not a miner or metallurgist in any sense, but he started to run the mine on business principles and has made a success of it. During the nine years he has been in charge the entire plant was destroyed by fire at one time, and was rebuilt. He put in chlorination works to handle the sulphurets from the 60-stamp mill and put the plant in good shape so that the whole venture has been profitable. All the debts were wiped out and the property put on a dividend-paying basis.

Locations covering some eight miles or more of the river bed of the San Joaquin river in both Fresno and Madera counties in the old Millerton district above and below Fort Miller, have recently been made. The locations are from Fort Miller to Cassidy Bar, famous in early days of California as rich placer diggings. The river at this point works its way through a narrow gorge. Numbers of speculative attempts have before this been made to mine the river bed in this section but labor and money were lost. The locators in this instance supposed that some of the power companies were about to turn the water out of the river leaving the bed bare. The land covered by the locations is patented on both sides of the river so there is little chance that these locations will ever amount to much from a mining point of view.

There is talk of a dredge to work the Cash Sock mine on the Middle Fork of the American river about four miles south of Forest Hill, in Placer county. A dredge has been doing some intermittent work in that section, but it went down the gorge last winter. This supposed big river mine has never been put on a paying basis, and has had one misfortune after another, the last being the loss of the dredge. Dredge mining in torrential streams is not always what it is supposed to be and people with any experience keep away from such places with dredging machinery.

The North Star Mines Company, of Grass Valley, the most productive gold mine in the State, is paying 16 per cent. per annum in dividends on a capitalization of $2,500,000, besides carrying a reserve fund of nearly $1,000,000. In addition to this the company is constantly adding to its holdings and making permanent and extensive improvements about the property.

An important strike is reported in the Oriflamme mine in Alleghany district, Sierra county, where a vein was encountered in the crosscut tunnel being driven to intersect the Sixteen-to-One ledge. The ledge found is an entirely new one paralleling the Sixteen-to-One. The ore is of the same high grade found in the veins of the Alleghany section. The Oriflamme managers suppose that the Sixteen-to-One ledge runs through their ground and will continue the crosscut tunnel ahead to cut it.

Denver

Oct. 8—In the Cripple Creek district, the Jerry Johnson company's estate on Ironclad hill, during September, reports a production of about 850 tons of ore yielding 1½ oz. gold per ton, or about $25,000 gross value. Leasers on the Prince Albert, on Beacon hill, report a surface discovery of a flat orebody 10 ft. thick, assaying from $15 to $30 per ton. The ore is being quarried. The September production from the Mary McKinney main shaft, under the lease of the Western Investment company, was 725 tons, valued approximately at $21,000. Other lessees on the same property shipped about 700 tons of milling ore as well. The Chicken Hawk, adjoining the above property, is producing ore containing from 1 to 2 oz. gold per ton from a depth of 650 ft. Charles Waldron, manager. Six sets of leasers are working the old Victor mine, on Bull hill, and 20 carloads were shipped during September, the average value being given as $20 per ton. F. D. Roscoe, of Victor, is manager. The Portland Gold Mining Company has declared a quarterly dividend of 2c. a share, payable Oct. 15, amounting to $60,000, and bringing the total amount paid to $8,347,000. It is estimated that the new mill will be ready for a trial run by the middle of December.

The State Bureau of Mines gives the gold production of Summit county from lode and placer for 1908 at $171,235. This year it is now estimated that the production will be between $800,000 and $900,000—a very healthy increase.

It is reported here today that the old Harrison smeltery at Leadville has been purchased by Denver men, and has contracted with the Robinson mine at Kokomo for a supply of zinc ore, for the treatment of which the plant was recently equipped.

At Leadville the Yak tunnel is under the South Evans amphitheater, and pushing on under the Mosquito range, having been driven 3½ miles from its portal. The manager is Walter W. Davis, of Leadville.

The Camp Bird gold mine at Ouray has paid nearly $6,000,000 in dividends up to September 1.

By a decision of Judge Allen, in the district court, on Oct. 6, it was established that when a leasing company had done sufficient work to prove that the lease was unremunerative, it might abrogate the lease and be relieved from making other efforts to find ore, as required by the contract.

The Mine and Smelter Supply Company has filed a suit in the United States Court against the Hendrie & Bolthoff company, and the Card company. The plaintiff claims to have purchased the rights to the Wilfley ore-concentrating table from Arthur Wilfley, the inventor, and avers that the two defendant companies are manufacturing and selling this table under another name, thereby infringing on its rights. Rights to other machinery sold by Wilfley to the plaintiff company, are, it is alleged, also being infringed upon. An injunction and damages are asked for.

In Gilpin county, shipments of concentrates from the Golden Flint mill at Perigo and from the Smuggler mine in the same vicinity, are now being made via Rollinsville, on the Moffat road, to the new Modern smeltery (pyritic) at Utah Junction, on that railroad.

The Colorado School of Mines is preparing to erect an experimental ore-dressing and metallurgical plant, which will provide not only a laboratory for the school, but also a modern testing plant for the benefit of the mining industry. President Victor C. Alderson has issued a circular to the engineers throughout the State, asking for comments, suggestions and criticisms on the preliminary plans, which accompany the circular.

The Bull-Domingo, at Silver Cliff, which is credited with a past production of $1,500,000, is to be re-opened, and exploitation work commenced from the 1000-foot level. The mine has been unwatered, and a new hoisting plant installed. It has had a more or less checkered career, having been opened and closed four times, twice by fire, which destroyed the surface plant. Its product has been chiefly silver-lead. J. H. Robeson and others, of Denver, are lessees.

At Fluorine, in the Black Range district of New Mexico, about 30 miles from Engle, on the Santa Fe, a belt of gold- and silver-bearing veins of great richness is reported as having been developed during the summer. It is stated to be 15 miles in length by two in width, and the country rock to be andesite, traversed by porphyry dikes.

Another one-time celebrated Colorado mining camp has apparently got its second wind and is coming to the fore again, for at Creede, in Mineral county, the Humphreys tunnel is being driven with machine drills and the Humphreys mill, the property of the Creede United Mining Company, is being put in working order. A. E. Humphreys is general manager. The above company is credited with $187,500 dividends paid in the past on its $500,000 capitalization. The North Creede Mining Company, lately organized with a capitalization of $500,000, has a large area of comparatively undeveloped ground, which will be at once systematically explored. Charles J. Hughes, Jr., and C. S. Thomas are the main owners.

In Gilpin county, the Central City, Russell Gulch and Black Hawk gold-mining districts have actually taken on new life. The Newhouse tunnel has cut a big vein which contrary to usual results in such cases shows pay values at the intersection, and which as nearly as can be determined at such depth below the surface, and with the unknown quantity of vein dip, is the Kansas-Burroughs vein. The great California vein will be intersected shortly after the first of next year, and great things are expected. Henry P. Lowe is actively working the Topeka and Frontenac, and the Scotch thread people, the Coates Brothers, are working the Druid company's mine, on the same vein as the Frontenac, under Max Boehmer, and paying steadily.

The Royal Oak mine, in Taylor park, Gunnison county, is said to be the scene of a new strike of 10 ft., of ore running 40 to 80 per cent. lead and a small amount of silver. All that is needed to make many shippers of lead ores in this region is railway facilities, of which at present it is devoid.

The Camilla mine, on Pomeroy mountain, at Hancock, on the Colorado & Southern, near Buena Vista, is putting in supplies for a winter siege. The vein is large and well defined on the surface, and carries from four to five feet of silver-lead ore; and in one fork of the vein at 11,500 ft. elevation a large pocket of almost solid gold was found; but owing to the great elevation and rugged character of the mountain, the veins could not be worked from the surface, so a long cross-cut tunnel was driven from the valley, which will tap the vein 800 ft. below the surface. This tunnel is now in 1809 ft., and has about 200 to 300 ft. to drive to reach the vein. The property is owned by a Denver syndicate. Ex-Lieut. Gov. W. G. Smith, president and manager.

Butte

Oct. 8—The Pilot-Butte Mining Company has called a special meeting of stockholders to consider the financial condition of the company and to devise ways and means for the resumption of operations. In the notice of meeting it is stated that the company owns in fee one-half of the Pilot quartz claim and that there remains due on the purchase price of the remaining one-half the sum of $70,000; that the other indebtedness of the company amounts to about $85,000 secured by mortgage on the property; and that recent developments upon the adjoining Elm Orlu mine indicate that the Pilot claim should become a producer when developed to a depth of 1000 ft. To raise funds for further development the directors suggest the issuance of first mortgage bonds on the property in the sum of $375,000, payable three years after date, with interest at 8 per cent. payable annually.

Considerable interest has been aroused in the German Gulch district, situated about 16 miles west of Butte, owing to the fact that Charles Kemmerer, manager of the Conrey Placer Company, has taken an option on about 600 acres of placer ground at the head of the gulch. Mr. Kemmerer states that he will put in Keystone drills during the winter and prospect the ground, and if satisfactory results are obtained install dredges next spring. It is estimated that in the early days $45,000,000 of placer gold was taken out of the district.

President Gross of the East Butte company states that the company is now producing its copper for 10c., and that it is now in shape to produce 7,000,000 lb. of copper annually. Owing to the low price of the metal the company is bending its energies toward developing the property rather than toward production. Should the price of copper warrant it, the company's second furnace at the Pittsmont property can be put in commission at short notice.

Goldfield

Oct. 8—The Goldfield Consolidated has discovered a new body of high-grade ore on the 730-ft. level of the Clermont shaft. An average sample from 15 mine cars gave returns of $1502 per ton, and from nine cars, $1822 per ton. Alunite is freely distributed throughout the ore, a feature which is characteristic of the high-grade orebodies of the Mohawk vein system. The company will add 40 or 50 more stamps to take care of the increased reserves.

The Combination Fraction company, which recently made the discovery of rich ore, has announced a dividend of 10c. per share, amounting to $93,000. The company is controlled by George Wingfield, and has an agreement with the Consolidated in regard to extra-lateral rights.

It is stated authoritatively that the construction of the extension of the Tonopah & Tidewater railway from Goldfield to Ely will be begun before the end of this year. The line will probably go via Hamilton, White Pine district, and although there is some difficult country to pass through, the maximum grade will be only 1.5 per cent.

Joplin

Oct. 9—The conditions in the Kansas zinc camps have been greatly improved by reason of the discovery of a deeper ore horizon and the installation of large modern mills. On the Falenbach land south of Galena and on a tract controlled by O. C. Ihlseng north of Galena, ore has been found at a depth of 300 ft. in limestone, with very little flint. Another deep orebody has been developed south of Badger-Peacock mine, by O. DeGraff, and also on the Hubbard farm in the same locality. The idea prevails that all of the small orebodies are underlaid with a deeper run of ore and extensive exploration to prove this theory has now been undertaken in the district.

Cobalt

Oct. 9—Good reports come from Montreal river, in the Miller, Everett and Le Roy Lake districts. At Everett lake the Everett Lake Syndicate has had a force of men at work all summer and 50 veins have been discovered. On some of these silver has been found at the surface. The Le Roy Lake Syndicate is sinking three shafts, one of which is down a depth of about 100 ft. At this point some good silver values were obtained. Another good discovery of ore carrying

about a thousand ounces silver has been made on the Welch claim. The Harman, McDougall & Ross Syndicate. operating to the east of Le Roy lake, has had a small force of men engaged in surface trenching, and several promising veins have been discovered. This syndicate will shortly commence operations on a much larger scale. The wagon road from Elk lake to Gowganda has now reached Le Roy lake, and this will aid very materially in opening up this district. The German Development Company, which has been operating quite largely around Miller and Everett lakes, intends to dispose of its holdings, and will confine its attention solely to large coal deposits which it has in the west. In Gowganda itself the results so far have been rather disappointing. This is in great measure attributable to the enormous price of supplies. During the coming winter this section of the country will come in for a good deal more attention, and the good roads that are being built will enable many of the small companies to get in supplies at a figure that will permit them to carry on their work. Many good discoveries have been made on the properties round Gowganda, but the country is still suffering from the effects of the subsequent reaction of the boom of last winter. There is practically no possibility of a repetition this season. It is currently reported that the Larder Lake district will come in for a good deal of attention as soon as the winter roads are in shape.

Toronto

Oct. 8—The provincial department of mines has received reports of material gold discoveries in Whitney township and neighborhood lying to the west of Nighthawk lake near Porcupine lake. Samples of the ore were also received which show visible gold. The department is making investigations. The interest in the new field is increasing and already 500 prospectors are on the ground, the route to which is by the Driftwood river, a tributary of the Abitibi.

The reports which have been in circulation of a contemplated merger of the large steel and coal industries of Canada appear to have some foundation. James Ross, president of the Dominion Coal company, admits that he has more than once been approached with a proposition to purchase his extensive holdings in the company at a good price. He states that he refused to entertain the proposal, unless the interests of the other stockholders were included upon equal terms.

Ten thousand acres of bituminous coal land have been located on the Peace river in British Columbia, just west of the Alberta boundary by a syndicate of eastern Canadian capitalists represented by R. Brutinel, of Edmonton. Although small seams of coal had previously been found along the Peace river, the existence of so large a workable deposit was not known until the claim was recorded. Theodore Davis, a mining engineer acting for the syndicate, has made a survey of the property and declares the coal to be excellent both for manufacturing and domestic purposes, and that it will coke to the extent of 86 per cent. The syndicate will not be able to do much to develop the property for four years, owing to the want of transportation facilities. By that time it is anticipated that the Morinville branch of the Canadian Northern railway will be extended to Peace river, when it will be feasible to ship the coal down the river to the railway.

As the result of strong representations made to the Ontario government as to the injurious effect of high royalties upon mining investments and industries, it is understood that the question of considerably reducing the royalties now payable by some of the Cobalt mines is receiving favorable consideration. The companies now subject to royalty are the Right of Way, Townsite, Nancy Helen, Cobalt Station Grounds, Railway Reserve, Jackpot and O'Brien 25 per cent.; Wright Mining Company 15 and 25 per cent. according to value of ore; Chambers-Ferland and Temiskaming & Hudson Bay 15 per cent. and Crown Reserve 10 per cent.

Mexico

Oct. 10—The report of the new discoveries in the Asientos district of Aguascalientes have attracted attention. In fact, the reports are somewhat misleading. The actual discoveries made recently are not "new," merely the encountering of the surface oxidized ores in the sulphide zones, but much more promising in size and content, and this has caused the recent new life and vigorous prospecting and development in the camp. This discovery has been retarded chiefly on account of lack of concentrated effort and capital, many properties being in the hands of poor owners. The only really "new" discovery has been made by T. H. Hamilton, superintendent of Santa Francisca mines of the American Smelting and Refining Company, who has taken up about 60 claims for this company in an hitherto unexplored portion of the district, about 2 km. north of the Santa Francisca mines. These properties are said to contain good gold veins. The other discoveries have been made on extensions of veins already explored, or in depth as previously stated. On the Alta Palmira vein, Charles Lucas and John Henderson have struck ore in the adjoining claims, the Esperanza and Hannah Francis, and Abram Rapp is opening up a fine body of sulphide of copper with good silver values at water level in the old Alta Palmira mines. He has attained a depth of 350 ft. The Aguascalientes Metal Company, George Crowder in charge, is in good ore of exceptionally large width at the 450-ft. level, and has a large tonnage of both shipping and concentrating ore opened up. This is the largest developed copper property in this camp. On the Santa Rita and Purisima claims of El Tabor y Anexas Company, Bruno Newman, manager, crosscutting has started from the main shaft at the 325-ft. level, and it is expected that the continuation of the surface ores will be found, as has been the case in the "Aguas" Metal company mines, the adjoining property. The Santa Francisca silver mines of the Smelting company continue a daily output of 200 tons, all of which is shipped to the smeltery at Aguascalientes. These mines, despite the low silver values and the heavy timbering and pumping expense, are earning a fine profit. Several good lead-silver-gold prospects are showing up well, but development is retarded because of the low lead and silver prices. The future of lead production in this camp is promising. In Tepezalá the Guggenheim Exploration Company has also found new orebodies at depth, and is blocking out a large tonnage for shipment to the Aguascalientes smeltery. These mines have been steady and very profitable producers for this company for about 15 years, and yet are explored but little. The Leonora mines, belonging to J. M. Daniels, at Jalpa, have produced high-grade silver concentrates without interruption, packing them 70 km. on burros to the Aguascalientes smeltery, and experiments are now being made to treat their large lower grade dumps, which cannot stand the heavy haulage charges.

The application of electric power to mining in Mexico is becoming very widespread. One of the most important projected installations is that headed by Dr. F. S. Pearson. This contemplates the erection of a dam on the Conchos river near Santa Rosalia, Chih., for the purpose of generating power, which will be transmitted to all of the Chihuahua mining districts. In the western part of Chihuahua the Mines of Mexico Company, a Denver company, has a concession for the installation of a hydraulic plant on the Mayo river in Sonora to supply the mines of western Chihuahua. Work will be undertaken soon on the hydroelectric project on the Altar river, Sonora. This installation will supply a number of the mines and will be used for irrigation purposes also. The Chacala company in Jalisco has obtained a loan of $2,500,000 from the National Loan bank of Mexico City for the purpose of installing a hydroelectric plant on the Santiago river near Guadalajara. A concession has been granted for a hydroelectric installation on the Quepalta river in Queretaro. Another concession has been granted for the Matamoras river in Puebla. These are some of the important projected installations which indicate the very general introduction of hydroelectric power in connection with the development of Mexican industries.

Mining News from All Parts of the World

New Enterprises, Installations of New Machinery, Development of Mines and Transfers of Property Reported by Special Correspondents

THE CURRENT HISTORY OF MINING

Alaska

Fairbanks—The quartz-lode development in the district is reported promising.

Big Thing—The mine at Skagway will build a compressor and tramway this winter, costing about $80,000. W. H. Vance, superintendent.

Gold Bullion—A clean-up of $12,000 in the 13-day run is reported on this property on Willow creek at Knik.

Seward—Reports from Valdez creek indicate a good cleanup this season.

Nome—Much development work has been done on the Dutton-Chilberg copper-gold property. A tunnel is being driven which will permit of it being worked far below the outcrop.

Arizona

COCHISE COUNTY

Courtland Copper Company—The company has been organized with $5,000,000 capital to develop claims near the Calumet & Arizona property at Courtland and near the Commonwealth mine, Pearce.

Calumet & Arizona—Shipments are being made from Courtland to the Douglas smeltery.

McKittrick—Ore is being shipped from Gleeson to the Copper Queen smeltery, Douglas. It is reported that the Copper Queen interests have control of the McKittrick and Costello properties.

Bisbee Camp—The September production of the Copper Queen was 9,050,000 lb of copper. The Calumet & Arizona smelter output for the month was 4,500,000 pounds.

Bunker Hill—The Chicago Exploration company, William Wallace, representative, is planning to open this property at Tombstone. The shaft on it is now down 555 feet.

April Fool—Final payment on this property at Courtland has been made by Calumet & Arizona company. The company is taking up other options in the district, including the Maid of Sunshine and the King Solomon mines.

Black Queen—The property at Paradise has been purchased by Renwick White and is being developed.

Boston-Courtland—A Cyclone drill is being used to prospect the ground near the depot.

GILA COUNTY

Cactus—The survey of the Miami railway to the mine is being made by Southern Pacific engineers.

Old Dominion—The September copper output was 2,672,000 lb.; in 1908 it was 3,181,000 lb. The net earnings for the month are reported at $60,000, and the cost of copper is estimated at 10¾c. per pound.

Schulze—The claims at Globe have been acquired by Salt Lake company in which Samuel Newhouse is interested. The development work has been started with J. C. Dick in charge.

Gibson—The mine is yielding high-grade copper ore which is teamed to the Old Dominion smeltery. The ore occurs in the Pinal schists.

GRAHAM COUNTY

Shannon—The company is interested in the projected extension of the Gila Valley & Globe railroad, east to Guthrie, connecting with the Arizona & New Mexico railroad. This would make possible an outlet for the new Shannon road.

Gold Belt—A 10-stamp mill will be installed at this mine by Morrison & Berstein, of Morenci.

YAVAPAI COUNTY

Crown King—The mine in the Bradshaw mountains has been sold at receiver's sale to the Yavapai Consolidated company for $75,000.

United Verde—The company is going to install a Knudsen smelting furnace, which will be the first of this type in North America. It is being built by the Colorado Iron Works Company, of Denver.

California

AMADOR COUNTY

Defender—The mine at Pine Grove has been closed. The cyanide plant was closed some weeks since, it being reported that some of the solution going into the Mokelumne river was poisoning the fish.

Bunker Hill—Twenty stamps will be added to the 20-stamp mill.

BUTTE COUNTY

Tioga—Ore has been struck in the mine at Bucks Ranch, under bond to John MacBean.

North California—Several camps are being put in order at Big Bar. A. E. Jackson, manager.

CALAVERAS COUNTY

Ariel—The mine, Mokelumne river district, has been bonded and has been supplied with new cars, drills, and air compressor.

Duck Bar—At the property near Murphy, W. H. Matteson, Stockton, manager, coarse gold is being taken out.

EL DORADO COUNTY

Encinal—The gravel mine on Cedar creek near Placerville will start up, C. S. Bolton, in charge.

MODOC COUNTY

Hoag District—Work is progressing on the mill ditch near Fort Bidewell and the buildings, ditches, etc., will soon be in readiness for the new mill for custom ores.

NEVADA COUNTY

Black Swan—Sowell Brothers have found the lode in this mine at Mooney Flat. The mine is an old one.

Yellow Metals—The Grizzly hill mill buildings are being hauled to the mine at Bowman's dam.

PLACER COUNTY

Gravel Channel—Leo P. Harris, of Colfax and N. L. Neilson, of San Francisco have taken a bond on the J. G. Dodds land at the head of Big Secret cañon, near Colfax. There is a wide gravel channel which has not been worked. A shaft is to be sunk.

Bogus Thunder—The old mine near Deadwood is being reopened after 30 years' idleness.

Cash Rock—Superintendent Brule is about to construct a dredge to take the place of the one wrecked last winter near Cash Rock.

PLUMAS COUNTY

Poplar Creek—The company has recently acquired 160 acres of mineral land in Poplar valley. The gravel is now to be opened.

Plumas-Eureka—The mine, long idle, but once a famous producer, is to be again worked and preparations to that end are being made.

Claybank—At this mine, near La Porte, now controlled by Oregon men, 15 men are at work retimbering the tunnel and preparing for reopening.

New York—The Greenville Pacific Development Company, W. S. Haskins, manager, will probably renew its bond on this mine near Greenville.

TRINITY COUNTY

Headlight—The new owners of this mine, near Carrville, have begun erecting a 40-stamp mill and chlorination plant.

TUOLUMNE COUNTY

Karmac—The company has purchased the Standard and Daniels claims five miles west of Jamestown, and on the Hancock mine it is sinking.

La Fiesta—The holdings of the company near Groveland, have been sold by the sheriff. There is a 10-stamp mill.

Colorado

CHAFFEE COUNTY

Ben-Della—Tellurium ore is reported in this property near Salida.

Colchester—The property on the White ranch at Cleora will be operated by a new company, represented by Messrs. Foster and Sullivan, of Salida.

CUSTER COUNTY

Humboldt—The mine at Rosita has been leased to Humphrey and Thompson, of Cripple Creek, and the shaft will be sunk to a greater depth.

Jenny—The shaft is being sunk on this property in the Spalding district and the new hoist installed.

Terrible—This mine at Isle has been bonded for $250,000. Plans for development are announced.

GUNNISON COUNTY

Abe Lincoln—A lease on the property near Bowerman has been taken by Frank L. Fuller, of Denver, and David R. Snead, of Salina. The property has a 10-stamp mill.

SAN JUAN DISTRICT

Favorite—Felix Leavick has made a discovery of gold ore on this property at Ophir.

Peerless San Juan—Work on the reduction plant is being pushed to complete it before the first of the year.

Silver Lake—High-grade silver ore has been discovered on this property by leasers.

TELLER COUNTY—CRIPPLE CREEK

Portland—Excavations are completed and part of the structural material on the ground for the 300-ton cyanide mill for the treament of the raw low-grade ore of the district. The mill will be completed Feb. 1.

Roosevelt Tunnel—The tunnel advanced during September 355 ft. The north heading from the intermediate shaft is now in 3045 ft. The tunnel has now been driven beyond the 11,000-ft. point.

Isabella—Bids for leases are asked for the Empire shaft ground.

Portland—The Doyle-Burns suit involving this mine has been settled out of court. The action involved a million dollars and has been in the Iowa courts for several years.

Idaho

BANNOCK COUNTY

Ft. Hall Mining and Milling—The company is unwatering the mine in the Ft. Hall district, near Pocatello, and remodeling the mill. Frank W. Mosher, of Chicago, has been reëlected president of the company.

LEMHI COUNTY

Salmon River Placers—John Berger, of Spokane, is installing a turbine wheel and constructing a 700-ft. ditch to pump 1,500,000 gal. each 24 hours to the high-bar placers.

SHOSHONE COUNTY

Star—Work on a 6000-ft. bore to tap the ore belt 850 ft. deeper than present workings is commenced. The portal is in Grouse gulch.

Snow Storm Extension—Development will be started on a large scale. The tunnel now in 700 ft., will be continued under contract let to Edward Eisman.

Nabob—A tunnel 2015 ft. long is being driven to tap the ore and drain the mine. It is now in 82 feet.

Illinois

DOUGLAS COUNTY

A 4-ft. seam of coal has been struck by boring on the Martin farm, near Newman. The coal is overlaid by 4 ft. of shales.

FRANKLIN COUNTY

A tract of 4000 acres of coal land has been sold to a syndicate including Loren N. Wood, A. Newell and others, of New York. Mines are to be opened at once, and spur tracks built to connect with the Chicago, Burlington & Quincy and the Illinois Central railroads.

Michigan

COPPER

Lake—The crosscut from the 5th level has cut the lode 100 ft. from the shaft and at the intersection shows a mineralization equal to that in the levels above.

North Lake—An outcrop has been found and the drill hole will be started from this point, which will eliminate the trouble on account of heavy overburden. The copper lode in No. 3 hole is now believed to be the Lake lode.

Keweenaw—The Osceola lode has been found by the diamond-drill operations. This lode has not carried commercial copper in any of the properties north of the Calumet & Hecla. The two shafts on the Kearsarge lode are in good copper ground.

LaSalle—Shipments are to be made to the Allouez-Centennial mill and will come from the stock pile and the openings of No. 1 Tecumseh shaft.

Ahmeek—Shafts Nos. 1 and 2 are down 800 ft. and the deepest openings and extensions yield ground up to the high average. Rock hoisted is shipped. The new shafts 3 and 4 are down 300 feet.

Franklin—The shaft on the Pewabic lode is nearing the 27th level. It is in the footwall and crosscut to the lode. Openings at the 23d, 24th and 25th levels are proving a good grade of stopping ground.

Oneca—No. 1 drill hole has reached 650 ft. No. 2 hole is down over 200 feet.

Adventure—Encouraging copper-bearing ground in the two crosscuts from the old works has been encountered. The lode exposed is probably the same opened on the Mass tract and known as the new Mass lode.

South Lake—Diamond drilling has started on the footwall of the Evergreen lode and will ultimately strike the zone of the lodes disclosed on the Adventure land.

IRON

Republic—The Cambria Steel company will ship 175,000 tons from this mine this season.

Cleveland Cliffs—Work on the water-power project for the Carp river will not be undertaken until spring. The company has much development work under way in the Swanzy district, and is developing new area at North lake, west of Ishpeming.

Hiawatha—The Buffalo & Susquehanna company is installing an electrical plant for this mine in the Iron River district. Exploration work has developed an important orebody.

New York State Steel Company—The company which has been operating on the Mesabi has taken options on the Goodman and Ziskofsky mines, which have been explored by the Gleason company. The new company will continue explorations and development.

Minnesota

IRON

Holman—The property at Coleraine is being stripped over a mile long and several hundred yards wide.

Shagawa—This property on section 30, at Ely, is expected to ship next season.

Montana

BUTTE DISTRICT

Butte & Milwaukee—This property in the North Butte section, controlled by the Butte-New York company, will resume operations.

Anaconda—A large output of glance ore is coming from the 2200 and the 2400 levels.

Davis-Daly—A canvass of the stockholders in Montana shows that F. A. Heinze has most of the proxies. No further contest is expected at the Oct. 15 meeting.

Butte & Superior—The contract has been let to the American Metal Company to erect a mill near Butte for the treatment of the zinc ores of the mine.

East Butte—The second furnace is ready to blow in and will be placed in operation as soon as the copper market justifies it. work has not been abandoned on the old East Butte property as reported.

Butte Copper Output—The copper production of Butte for September was 23,918,180 lb., which is 2,220,000 lb. less than August, due to one holiday in the month and a four-day shutdown, due to the labor troubles.

Bullion Output—The United States assay office at Helena received during September bullion from Montana in the sum of $163,030, a gain of $75,000 over the same month, 1908. Fergus county leads with an output of $51,641.

JEFFERSON COUNTY

Independence—Messrs. Carpenter, Knotts and Truscott are working the property at Amazon under an 18-months lease and bond for $10,000. The tunnel is in 150 ft. which gives a depth of 110 ft. The face of the tunnel is in ore.

Blizzard—The property, two miles west of Wicks, is under bond to Thompson and Joynt.

Black Jack—The property, 1½ miles northwest of Corbin, which has been operated for two years, was closed last week, temporarily.

Minneapolis-Corbin—The shaft on the Copper King claim is now down 185 ft. and several stringers of ore have been cut.

Sun and Bohemia—These claims at Corbin have been bonded to an English company for $125,000, and development to 1000 ft. is to be undertaken.

LINCOLN COUNTY

Victor-Empire Mining & Milling Company—The company, incorporated with a capital of $600,000, owns five silver-lead claims, 10 miles southwest of Libby. The main tunnel is in 850 ft. and there is another tunnel in 69 ft. and a 25-ft. shaft. A 3-drill compressor has been ordered. W. B. Dilley, manager.

Nevada

CLARK COUNTY

Monte Christo—So far during 1909 this mine, controlled by Douglas White, Los Angeles, has shipped about 4000 tons of smithsonite, assaying about 45 per cent. zinc. The mine is eight miles from the railway, the cost of carting the ore thereto and loading on cars being $2.25 per ton. A freight rate of $8 per 2000 lb. to Kansas smelting points has lately been secured.

ESMERALDA COUNTY

Lucky Boy—Miller & Adams have started operations on their own account on the Hubbard lease.

West End Consolidated Mining Company—The annual report shows total work for last year, 4223 ft., and total shipments, 7605 tons. The financial statement shows a deficit of $71,816. Six thousand tons of ore are on the dump.

Goldfield-Belmont—The Burke lease is entered into a new ore shoot, yielding high value.

EUREKA COUNTY

Cortez District—Properties adjoining the old Cortez mine, which is said to have yielded $50,000,000, have been purchased by Patsey Clark and associates. Active work is being undertaken on other properties in the camp.

Buckhorn—George Wingfield has paid $100,000 for claims at Buckhorn. Davis & Loftus have purchased additional adjoining ground.

Nevada Treasure—Two shafts are down 200 ft. on vein. Good gold content is reported. The property is in the new camp of Kearns about 30 miles southward of Battle Mountain. Patsy Clark in charge.

LINCOLN COUNTY

Nevada-Utah and Ohio-Kentucky—The settlement between these companies at Pioche has resulted in the resumption of work. The Susan Duster shaft has been reopened, and the No. 1 shaft of the Nevada-Utah. The Day mine of the Nevada-Utah at Jackrabbitt has been forced to suspend shipment owing to the close of the Tintic smeltery.

Gold Prince—A 60-h.p. gasolene engine has been installed for the compressor. Mine at Pioche, George Coxe, manager.

Los Angeles Cyanide Company—About 75 tons a day of tailings is being treated at the Keystone mill at Sandy.

Quartette—The mine at Searchlight has encountered the orebody on the 1100-ft. level.

New Year's Gift—A. W. Crittenden has another lease at 20 per cent. royalty from the Homestead company at Searchlight.

Yellow Pine—The mine at Goodsprings is sinking on a zinc-lead orebody.

LYON COUNTY

Mason Valley—Additional reserve ore has been developed by the extension of the lower tunnel level. Fred A. Flindt, manager.

NYE COUNTY

New Bonnie Clare—The company has authorized the reconstruction of the mill in the Gold Mountain district.

Pioneer Consolidated Mines Company—The company has been organized by D. R. C. Brown, of Aspen, Colo., and George Wingfield to operate the Valley View mine at Pioneer. The company also has Ophir d'Oro, Conservative, three claims of the Bullfrog-Pioneer company and the K. K. claim of the Tobin Brothers. Plans for a large mill are included in the company's program.

Lucky Jack—James C. Conner, of Colorado Springs, will resume operations on this property adjoining the Shoshone at Rhyolite.

STOREY COUNTY

Sutro Tunnel—The work of repairing has now been completed to 14,500 ft. from the portal and is going on at the rate of 100 ft. per day. There remains 3100 ft. to complete to make a connection at No. 5 switch.

Mexican—Work has been started on this property adjoining the Ophir on the north. A drift will be run on the 2300-ft. level to cut the orebody exposed on the 2200-level.

WHITE PINE COUNTY

Military and Manhattan Ely—Options are out on these properties, presumably for the Cole-Ryan interests.

Giroux Consolidated—The Ely-Giroux Extension and the Blackfoot have been deeded to the company. It is expected that the company will secure also the Military group and other property south and west of its present estate.

Nevada Consolidated—The fourth reverberatory furnace and the fourth converter stall now being in operation at the Steptoe reduction works, the October output of copper is expected to show a decided increase over previous months.

Cumberland-Ely—The proposed merging of this company with the Nevada Consolidated is again engaging attention, and it is reported that an offer has been made on a basis of 3¼ shares of Cumberland-Ely in exchange for one of Nevada Consolidated, equivalent to about $7.50 per share for Cumberland-Ely. Opposition has already been manifested by minority shareholders who maintain that while Nevada Consolidated can show approximately 10 tons of ore developed to one in Cumberland-Ely, this condition is claimed to be due merely through lack of development at the latter property.

New Mexico

GRANT COUNTY

Burro Mountain—Phelps, Dodge & Co. has purchased these mines in the Burro Mountain section, including over 1000 acres.

SOCORRO COUNTY

La Joya—Concessions for mining on this grant have been issued to Joseph Vezetti. The mines are 20 miles west of Socorro.

Mistletoe—The mill at Kelly is ready and will start as soon as the tramway is finished.

Oregon

Baker County

Mormon Basin—Active development is under way in the old placer district on quartz lodes. The Rainbow mine, owned by the Commercial Mining Company, of Portland, is now down 240 ft., and has opened a gold vein said to run 2 oz. The Humboldt on the same vein is opening up lower-grade ore. Both mines have mills. The ore is free-milling in the district to 200 ft., at which it changes to arsenical sulphides. The orebody is on the footwall of a basalt dike, carrying low gold values throughout.

Independent Mine—The mine of the Consolidated British American Company of Spokane has made a rich strike at Sumpter at a depth of 200 feet.

South Dakota

Black Hills District

Echo—A new company is taking this property near Deadwood, now opened up 200 ft., and will develop and explore the orebody already disclosed.

Tinton—The mill has been overhauled and the company will resume.

Texas

Brewster County

Terlingua—The erection of two new quicksilver furnaces in the district is planned. The Gaines syndicate is doing development work on several properties.

El Paso County

El Paso Tin Mining and Smelting Company—The company has been organized by by C. R. Morehead, El Paso, to develop tin deposits at Mundy Spring, 14 miles from El Paso.

Utah

Beaver County

Grand Dominion—A blende oreshoot 18 in. wide has been disclosed.

Emery County

Castle Valley Coal Company—The new mine in Cedar creek cañon is well advanced, but no shipments will be made before February next. A branch line seven miles long is being built down Cedar cañon to connect with the Utah Southern road.

Grand County

Placer Mining—Placer mining in Grand county is making big strides. Arrangements are being made for a stamp mill as the gravel remaining in the pan has been found to contain gold.

Juab County

Lower Mammoth Extension—All the stock of the Lower Mammoth Extension Mining Company has passed into the hands of James C. Jensen, of Heber City.

Chief Consolidated—At the 1400 level good ore has been found in a crosscut. Walter Fitch, manager.

Salt Lake County

Yosemite Mine Company—The company has been formed to take over the Cluster claims and the Mississippi in the Bingham camp.

Summit County

Little Bell—Large bodies of ore in new territory are being disclosed by the development at Park City. The drifts are in a section never before explored. From the development work the company is shipping 350 tons a month.

Tooele County

Lucy L.—At the Deep Creek property the discovery of tungsten has been made. Frank L. Wilson, manager.

Washington County

Reef Mining Company—The company has been formed with H. Welte manager, to operate in the old Silver Reef camp. The silver and copper is in a sandstone formation. A leaching process will be used.

Washington

Snohomish County

Imperial—The Independent mine concentrator has been purchased and will be used for the Imperial ore on a large scale.

Pierce County

St. Paul & Tacoma Lumber Company—The company will erect an iron furnace at Tacoma at a cost of $100,000.

Okanogan County

Centaur—The company has let a contract for a free-milling ore-treatment plant. C. H. Paxon, secretary.

Ferry County

Republic Company—A lease of the Midget mine, formerly the Tom Thumb, has been taken, and ore shipments will be commenced.

Belcher—The erection of a 400-ton smeltery is being considered.

Stevens County

Jay Gould—Work will be resumed in charge of F. C. Bailey.

United Copper—The spur from Chewalah is nearly completed. Production on a large scale will be started soon.

Wisconsin

Zinc-lead District

Fox—This property is reported sold to the Mineral Point Zinc Company.

Mills—Operations at Hazel Green will be resumed soon.

Forcite—Heavier pumps are being installed at this Benton mine.

Wallace—The company at Highland will build a mill.

Wyoming

Carbon County

Alameda—A new company has purchased the property nine miles northwest of Encampment and will continue development. P. J. Winters, manager.

Bighorn County

Hart Mountain Gold Dredging Company—The company has been organized to operate placers in Wyoming. A. R. Williams, Cody, manager.

Canada

British Columbia

James A. Moore, president of the Irondale Steel Company, of Irondale, Wash., has bought a large tract of coal and timber land on Graham island, and proposes to start work shortly on a coal mine.

Extension—An explosion at the coal mine of the Wellington Company at Nanaimo resulted in a heavy life loss.

Ontario—Cobalt

Peterson Lake—At a special general meeting of the shareholders in Toronto, Oct. 6, a vote was carried by a small majority expressing confidence in the present directors and approving of their action in resorting to litigation to settle the dispute between the management and D. M. Steindler and J. A. Jacobs, the former president and secretary. Messrs. Jacobs and Steindler addressed the meeting offering to submit all matters in dispute to arbitration.

Ophir—Instead of making the main station at the 100-ft. level the management has decided to go down to 200 ft. and cut a station there. The shaft is now down 130 feet.

Prince—This property, 20 acres in extent, adjoining the Temiskaming and the Pan-Silver, has been sold to an American syndicate headed by Colonel Bunker, of Chicago. The price is reported to be $250,000.

Cobalt Central—A new vein was recently discovered on the Gamey lot in a waterworks trench.

Badger Mines—The company will commence to sink the shaft to 400 feet.

White Reserve—The mine was closed down a short time ago, but will recommence operations Nov. 1.

Hargraves—In the workings on the new vein near the Drummond, ore carrying silver has been located.

Cochrane—The main shaft is down 250 ft., and drifting and crosscutting are being carried on at the 240-ft. level, where the vein is 14 in. wide of calcite and quartz heavily mineralized. Four other veins carrying low silver contents have been encountered in crosscutting. A shaft will be put down this fall on the vein near the Duchess, which makes a good showing a few feet from the surface.

Silver Leaf—The shareholders of the company have authorized the leasing of the property to the Crown Reserve for five years, subject to a renewal for a similar term. For the first five-year term the Crown Reserve is to pay a royalty of 25 per cent. on the output, and if the lease is continued for another term the royalty is to be increased to 35 per cent. The Crown Reserve is to spend $20,000 for the first year and $10,000 each subsequent year on the property.

Waldman—The new vein has strengthened at the 68-ft. level, and become more regular. Ore has been taken out running as high as 5000 oz. silver to the ton.

Right of Way—The shareholders have approved the action of the directorate in securing a controlling interest in the Cobalt Merger by acquiring 1,000,000 shares of the stock. The Right of Way will advance funds for the development of the Merger.

Ore Shipments—Shipments of ore from Cobalt for the week ending Oct. 2 were as follows: Crown Reserve, 125,095 lb.; La Rose, 450,803; McKinley-Darragh, 41,472; Nipissing, 67,721; O'Brien, 192,095; Right of Way, 63,294; Trethewey, 128,000; total, 1,068,480 pounds.

ONTARIO—PORT ARTHUR

Silver Mountain District—Samples of native silver ore brought in from this district to Port Arthur have attracted a great deal of attention.

YUKON TERRITORY

Dawson—The Canadian Klondike company will install two dredges next year. The Stewart River Company is prospecting at McQuesten and will purchase a dredge next year. The Yukon Basin Company is operating No. 1 dredge steadily with good success. In the Bonnifield district, Frank Berry and James Hamel are operating a hydraulic property covering 28,000 acres. A ditch conveying 5000 in. of water is being constructed.

Mexico

AGUASCALIENTES

Paso de Sotos Tin Mines—The exploration work undertaken by George Mitchell last year has been discontinued and there is no announcement of plans of resumption.

CHIHUAHUA

Guasisoco—This mining company has recently been organized by R. B. Koering, of Alamos, Sonora, to develop properties at Chinipas.

La Dura—The company, in La Dura camp reached from Moroles, has in erection a 100-ton cyanide plant. Manager, A. H. Maloney.

Rio Plata—The finding of a 3-ft. body of 80-oz. silver ore at the Santa Barbara mine, Guazapares, is reported. The cyanide plant is operating at partial capacity on tailings.

Naica—Coincident with the announcement of the intention of the Naica Company to erect a smeltery on the line of the Central, comes the report of increased mining and prospecting activities in the camp. The main producers are Lepanto, Gibralter, Ramon Corona and Fernandez. A new company has been organized for the Sensitiva-Zola-Carolina properties, and the Naica Mining Company, H. L. Dignowity, manager, and the Mines of Naica Company, T. H. Thofehrn, manager, are developing; the former is planning the use of diamond drills, while the latter has lately contracted for sinking machinery.

COAHUILA

Torreon Smeltery—Official statements following the meeting of stockholders are that the reported sale is unfounded. Arrangements have been made for starting of the 30-ton converter.

Mazapil—The lead smeltery at Saltillo is in successful operation, and its enlargement is planned. Manager, O. E. H. Carr.

DURANGO

Mexico Consolidated—The company has nearly paid off outstanding indebtedness and negotiations are under way for capital to install new equipment at the property at Guanacevi.

JALISCO

Amparo—The company has purchased $30,000 of electrical equipment preparatory to operation with power expected Jan. 1 from the Chapala Hydroelectric and Irrigation Company. The company has a contract for 700 h.p. at 100 pesos per h.p. a year, and expects to effect a saving of 30,000 pesos a year. Ten stamps will be added early next year, making a total of 60. The present mill is handling 5000 tons monthly. The fourth quarterly dividend of 2½ per cent. will be paid Nov. 10.

El Tajo—A shipment of 604 lb. of precipitates has been made from the recently inaugurated reduction plant. The first clean-up amounted to 10,000 pesos. The mill is handling 30 tons daily.

HIDALGO

Zimapan—The Hidalgo company is developing its properties, employing about 400 men blocking out ores to justify a proposed new 200-ton smeltery. Sidney Ludlow, manager.

SINALOA

Choix Consolidated—A 100-ton smeltery is being built at the mines near Choix. A. M. McDermott, manager.

SONORA

Candelero—The new mill at La Barranca, operating three Tremain units, is crushing 48 tons in 24 hours through 30 mesh. S. Ben. Smith, superintendent.

Mina Blanca—Work on the property in the Moctezuma district is being vigorously continued. New shaft is 200 ft. deep, below the point of the old workings. The mine is operated by the Mendorico Mining Company, E. P. Butt, manager.

Duluth-Moctezuma Company—Shipments at 40 tons per month are being made from the Monte Cristo mine, 30 miles east of Moctezuma. C. H. Jones, in charge.

Promontorio—Development work in the lower level has developed new ore ground. The mine is at Moctezuma; R. S. Vickers, manager.

Carmen Consolidated—The affairs of the company are being adjusted and plans are under way to commence work on the Sta. Maria, adjoining the Pedrazzini property.

Babicanora—The mine at Arizpe has been acquired by J. A. Evans and will be operated by him. Machinery for a 600-ft. shaft is being installed.

Santa Rosalia—A 3-compartment shaft is being sunk to develop the old workings. J. H. Hooper is in charge. Property is in the Arizpe district.

Transvaal—The diamond drill has been installed on the Cobre Rico mine 25 miles west of Cumpas, and is now down 225 ft. in concentrating sulphide ore. Work on the Buckeye has been discontinued. H. C. Beauchamp, manager.

San Felipe—Operations are under way on this and the Ventana mines in the Arizpe district acquired by the Calumet & Arizona company. This company has in all 2500 acres at Huepac and is constructing wagon roads from Poza. The bond on the mines is for $250,000.

Greene-Cananea—The September production was 3,854,000 lb. copper, 78,820 oz. silver, and 510 oz. gold.

Australia

NEW SOUTH WALES

Broken Hill Proprietary Company—The September production of the mines and refinery was 287,715 oz. silver; 7249 tons lead; 55 tons hard or antimonial lead. Of this production only 62,463 oz. silver and 728 tons lead were from ores mined by the company, the rest being from purchased ores. In addition to the above, there were made 7141 tons zinc concentrates, containing 95,614 oz. silver, 477 tons lead and 3334 tons zinc.

Metal, Mineral, Coal and Stock Markets

Current Prices, Market Conditions and Commercial Statistics of the Metals, Minerals and Mining Stocks

QUOTATIONS FROM IMPORTANT CENTERS

Coal Trade Review

New York, Oct. 13—Coal trade in the West is on an advancing basis still. Reports from the principal centers show increasing business in steam coal almost everywhere; while domestic coal begins to be a more prominent feature as the season advances. The Lake trade is still slow, however, and it begins to look as if the Northwest would be behind in putting in its winter stocks. Complaints of car shortage are beginning to be heard from various quarters. There is some tendency to advance prices, but this has been held in check by the usual tendency to overshipments.

Bituminous trade in the East is improving also, and shippers are looking forward to an active fall trade. Complaints of car shortage are louder than in the West, and for the first time in two years mines have had trouble on this account. Prices continue generally low, notwithstanding the better demand. There is too much competition to permit any increase at present.

The anthracite trade continues steady and without any special feature.

Rates on Cumberland Coal—The Pennsylvania, the Baltimore & Ohio and the Reading companies have applied to the United States Circuit Court for an injunction to restrain the Interstate Commerce Commission from enforcing the lower rates ordered on coal from the Cumberland basin to tidewater. Their contention is that the rates are unreasonably low. The new rates were to have taken effect Oct. 1, but the change is now postponed until the case has been heard by the court.

Coal Traffic Notes

Coal and coke tonnages originating on Pennsylvania railroad lines east of Pittsburg and Erie, year from Jan. 1 to Oct. 2, short tons:

	1908.	1909.	Changes.
Anthracite	3,826,497	3,584,449	D. 242,048
Bituminous	24,837,307	27,467,161	I. 2,629,854
Coke	5,168,371	8,096,720	I. 2,928,349
Total	33,832,175	39,148,330	I. 5,316,155

The total increase this year to date was 15.7 per cent.

Coal tonnage originating on the lines of the Southern Railway, seven months ended July 31, was: Tennessee district, 735,964; Alabama district, 1,317,201; total, 2,053,165 short tons, an increase of 538,355 tons, or 40.1 per cent., over last year.

Anthracite coal shipments in September were 4,416,120 long tons, being 217,847 tons more than in August, but 794,927 tons less than in September, 1908. For the nine months ended Sept. 30 the shipments were, in long tons:

	1908.	1909.	Changes.
Reading	8,827,368	8,406,477	D. 420,891
Lehigh Valley	8,049,249	7,317,277	D. 731,972
N. J. Central	6,181,431	5,666,239	D. 515,192
Lackawanna	7,341,801	6,907,679	D. 434,122
Del. & Hudson	4,704,767	4,540,278	D. 164,489
Pennsylvania	4,386,946	4,174,584	D. 212,362
Erie	5,424,355	5,542,291	I. 117,936
N. Y., Ont. & West.	2,104,171	2,032,063	D. 72,108
Total	47,020,088	44,586,888	D. 2,433,200

The total decrease this year was 5.2 per cent. Only one line, the Erie, showed a gain. The heavier decreases were on the Lehigh Valley and the New Jersey Central.

New York

Anthracite

Oct. 13—Business remains quiet and steady. The continued warm weather has held back the domestic trade, and dealers are hoping for a cold snap to start up business. This may be expected at any time now.

Schedule prices for large sizes are unchanged at $4.75 for lump and $5 for egg, stove and chestnut, all f.o.b. New York harbor. For steam sizes quotations are: Pea, $3.10@3.25; buckwheat, $2.25@2.50; No. 2 buckwheat or rice, $1.75@2; barley, $1.35@1.50; all f.o.b. New York harbor. Some individual and washery coal can be had at 10 or 15c. below quoted prices.

Bituminous

The tone of the market continues good, and inquiries are increasing. The Far East makes the best show just now, as the shoalwater ports are coming to the period when winter stocks must be laid in. Business along the Sound is fair. New York harbor trade is still irregular, coming by spurts. Supplies are good enough to prevent any advance, and prices remain about the same as they have been for some time. Contract deliveries are being called for on a good scale, better than they have been for some time.

A good many complaints are heard about car supply and the trouble seems to be increasing. At some mines there is said to be a very short supply and the allotments of cars are being carefully watched. Transportation continues irregular on most of the railroads, few cars coming through on schedule time; most are delayed several days on the road.

The coastwise vessel market is still rather oversupplied, though there is a little better call for small vessels which can enter the shoalwater ports. However, agents and skippers are anxious for cargoes, and willing to take them at current low rates. New York harbor quotes on small vessels 50c. around the Cape, with 5 to 15c. higher to special points. Philadelphia quotes on large vessels 60@65c. to Boston, Salem and Portland, 65@70c. to Portsmouth, 70@75c. to Lynn, and 75@80c. to Newburyport.

Birmingham

Oct. 11—A resumption of development in the coalfields of Alabama is the interesting event in the coal-mining industry. Three new mines have been started, one of them to be a large slope by the Tennessee Coal, Iron and Railroad Company in the Pratt Mines division, but in the vicinity of Wylam, 10 miles from Birmingham. The coal production in this State is showing improvement every week. There is a large shipment of coal away from here while the home consumption is steady. The railroad companies are bringing in empty cars to handle the increasing trade that appears to be certain in the next few weeks.

The production of coke continues to give a little worry, the demand growing stronger every week for coke, with the make not improving as well. However, there are a number of batteries of ovens which are being put in condition rapidly and during the next six months a large number of ovens will be constructed, so that by the middle of the coming year it is believed that every demand can be met.

Chicago

Oct. 12—Sales of steam coals continue to increase satisfactorily to agents and wholesale dealers; in the domestic field there is some complaint that the retailers are not buying largely enough since the increase in prices on some coals with the first of the month. But in general the overabundance of some domestic coals may be explained by the law of supply and demand—shipments to this market have increased so that there is considerable demurrage coal on tracks constantly, with the result of sacrifice prices on such coals. Screenings naturally have fallen in price, being a summer fuel for most manufacturers in the Chicago market, and have been sold at $1@1.10 in the last week. All kinds of Indiana and Illinois

coals have had some sacrifice sales of late and the market for eastern coals, notably smokeless, is not so strong as in previous weeks. The general situation, in short, is that the consignments to Chicago have been somewhat too large in nearly all cases and care should be used about sending more until the market is again somewhat free of overshipments.

Illinois and Indiana coals bring, in general, $1.75@2.50 for lump, $1.65@1.75 for run-of-mine and $1@1.30 for screenings. Smokeless holds to $3.55 for lump and $2.95 for run-of-mine, and Hocking to $3.15. On forced sales these quotations are cut 10 or 15c., except that there is practically no surplus Hocking on the market and the higher grades of smokeless hold up well. Gas coals are steady and quiet, Youghiogheny selling for $3.15. Anthracite is in fair demand, though no heavy sales are expected until there is a touch of cold weather, and all sizes are in good supply.

Cleveland

Oct. 12—Lake carriers are urging shippers to get coal forward as fast as possible, to avoid congestion later. Local trade is active, both for steam and domestic coal. Complaints are beginning to be heard about short car supply, notwithstanding the good weather.

Prices are firm. No. 8 district steam is quoted $2@2.15 for lump, $1.80 for run-of-mine and $1.40 for slack. Middle district is about 10c. lower on all grades. Massillon domestic coal is $2.95 for lump. Pocahontas is selling at $3.05 for lump and $2.35 for run-of-mine.

Indianapolis

Oct. 11—Business reports continue good, and trade has been active in steam coal; while the dealers in domestic coal are busy putting in stocks. Mines are making good time for the most part, and some of them are doing more than at any time for two years past.

There was an advance in the price of Indiana coal at the mines of 15c. a ton on Oct. 4. This had the effect of causing retail dealers to advance the price 25c. to the consumers and the demand was greatly stimulated lest another advance should be announced before the winter's supply was stored.

Pittsburg

Oct. 12—Demand for coal continues good, and Lake shipments have increased somewhat, it being now the hight of the season. Prices are unchanged, generally ranging from $1.05 to $1.10 for mine-run at mine, although there continues to be cutting, down to $1 in extreme cases. Slack is 55@60c. Labor continues scarce, and some additional miners could be employed.

Connellsville Coke—The market is steady and strong, the high prices recently reached being maintained. The price of $2.90 on Connellsville furnace coke on contract for next year was first touched the middle of September, and since then the market has been steady at $2.90@3, depending on brand, etc. On Sept. 1, quotations of $2.50 were made and were considered high by consumers. Eliminating coke produced by consumers and coke on long-term contracts, fully half the market coke for next year has been sold. A little was sold last August, and some was sold on scale contracts, based on pig iron, for first half or the entire year, the balance being sold on contract at flat prices, $2.85@3 during the past three or four weeks. Furnaces requiring somewhat in excess of 200,000 tons a month are still to cover, including in particular some steel works in eastern Pennsylvania and New York State, and a number of merchant interests in the Central West. The principal transaction of the week was a contract for upward of 25,000 tons a month for the first half, at $2.90. A number of 1000- to 2000-ton lots of prompt coke were sold at $2.75, $2.80 and $2.85 respectively. Foundry coke has been very quiet, and there is little interest in it for next year. We quote the market as follows, furnace coke being well established, while foundry-coke quotations are partly nominal: Furnace coke, $2.75@2.85 for prompt, $2.90@3 for first half or whole year; 72-hour foundry coke, $2.60@2.90 for prompt; $3@3.25 for next year.

The *Courier* reports the production in the Connellsville and lower Connellsville region in the week ended Oct. 2, at 423,819 tons, a gain of 5000 tons over the previous week, and shipments at 5042 cars to Pittsburg, 7934 cars to points west of Pittsburg and 882 cars to points east of Connellsville, a total of 13,858 cars.

St. Louis

Oct. 11—The weather has been unusually warm for October and the demand has eased up a little on this account. The market is readily absorbing all the coal that is being produced and prices are firm, though the upward trend has been temporarily checked. With the first touch of cold weather it is certain that there will be a rush for coal. Business is slow locally on account of the Centennial celebration, which is the largest held here since the World's Fair. A number of business houses have closed one-half day every day this week.

A large tonnage is moving to the country, especially on high-grade coal, the demand for which is strong. A slight improvement has been noted in the car situation in southern Illinois and the majority of the mines had a fair week's run.

Carterville 6-in. lump or egg is bringing about $1.60 per ton at mines or $2.27 St. Louis. No. 1 nut is offered for $1.20 at mines or $1.87 St. Louis. Screenings are 35@40c. at mine or $1.07@1.12 St. Louis.

Franklin county 6-in. lump or egg is selling at $1.75 at mine or $2.42 St. Louis and Franklin county nut is bringing $1.30 at mine or $1.97 St. Louis. Staunton, Mt. Olive or Springfield district coals are $1.35 at mine, or $1.82 St. Louis for 6-in. lump; 3-in. lump is $1.25 at mine or $1.72 St. Louis and nut coal is 85c. at mine or $1.37 St. Louis. Standard 6-in. lump is $1.10 at mines or $1.62 St. Louis; 7-in. lump, 90c. at mine or $1.42 St. Louis. Standard screenings are being offered for as low as 5c. per ton at mines or 57c. St. Louis. Screenings are getting so weak now that they will be given away for the freight in a very few days. Steam nut coal is offered for 50c. at mine or $1.02 St. Louis. Carterville washed No. 1 brings $1.65 at mines or $2.32 St. Louis, with No. 2, about 35c. less.

The price on anthracite coal is $6.95 per ton f.o.b. St. Louis for chestnut, stove or egg sizes and $6.70 per ton for lump.

Foreign Coal Trade

French Coal Production—Coal production in France for the six months ended June 30 is reported as follows, in metric tons:

	1908.	1909.	Changes.
Coal mined.....	17,810,421	18,122,169	I. 311,748
Coke made.....	994,734	990,892	D. 3,842
Briquets made....	965,244	1,077,434	I. 112,190

The increase in coal mined this year was 1.8 per cent.; the decrease in coke made was 0.2, and the increase in briquets 11.6 per cent.

Welsh Coal Prices—Messrs. Hull, Blyth & Co., London and Cardiff, report current prices of coal as follows, on Oct. 2: Best Welsh steam, $4.20; seconds, $4.02; thirds, $3.78; dry coals, $3.96; best Monmouthshire, $3.48; seconds, $3.36; best small steam, $2.22; seconds, $1.80. All per long ton, f.o.b. shipping port.

Iron Trade Review

New York, Oct. 13—The iron and steel markets continue to show marked activity and a strong demand for material.

In pig iron there have been heavy sales of foundry and basic iron in the East, while in the Central West there has been a call by the steel companies for bessemer and basic iron from outside furnaces. This indicates a larger demand than was expected, since the large companies are not able to meet it from their own blast-furnace capacity. Prices are naturally strong, but there is a limit to the possible advance. Foreign iron has been freely offered at seaboard points by agents, and it is evident that this must limit the point to which pig-iron quotations can be put.

In finished material the demand for

structural steel is hardly as strong as it has been; but this has been made up by the call for plates, bars, sheets and other classes of material. A good deal of bridge material is wanted. The demand for nails and smaller building material continues large and steady. Prices are strong; no material advances are recorded this week, but those made recently are well held.

The Pennsylvania Railroad Company has ordered 200,360 tons of rails for 1910 delivery, the order being divided among the following companies: Illinois Steel, 56,200; Carnegie Steel, 27,100; Cambria Steel, 41,800; Pennsylvania Steel, 41,800; Lackawanna Steel, 19,550; Bethlehem Steel, 13,910. The Steel Corporation gets 41.6 per cent. of the order, 58.4 per cent. going to independent companies.

Pig Iron Production—The reports of the blast furnaces, as collected by the *Iron Age*, show that on Oct. 1 there were 299 coke and anthracite stacks in blast, having a total weekly capacity of 564,900 tons; an increase of 39,900 tons over Sept. 1, and of 162,900 tons over Jan. 1. The estimated production of pig iron in September, making allowance for the charcoal furnaces, was 2,415,000 tons; for the nine months ended Sept. 30 it was 17,831,000 tons. The September production was the largest ever made in one month, and was more than 50,000 tons greater than that of October, 1907, which was previously the record.

Baltimore

Oct. 12—Exports for the week included 3,137,200 lb. steel billets to Liverpool; 796,300 lb. galvanized pipe to Antwerp. Imports included 664 tons ferromanganese from Liverpool and 1175 tons iron ore from Cuba.

Birmingham

Oct. 11—Southern pig iron is strong, and the quotations are again looking up despite the fact that but a few days ago $15 per ton for No. 2 foundry was reached. There have been a few sales made above $15, delivery during the latter part of this year, while some iron is about to be sold for delivery during the first half of next year stipulated. There companies in the Birmingham district are yet out of the market, but are protecting their regular customers. A runaway market is imminent. The demand is sharp, while home consumption is steady. The make in Alabama for September showed an increase of more than 20,000 tons as compared to September a year ago. There was a difference of more than 11,000 tons in the make in September as compared to August of this year. There appears to be no doubt that October will show a greater increase. The furnaces in blast are doing well while the number of furnaces in operation is again to be increased. The Sloss-Sheffield company expects to produce 35,000 tons of iron during this month, the largest amount in two years and over. Other companies are making the same record. There is no accumulation of pig iron. The steel plant of the Tennessee company at Ensley is working steadily on orders in hand. The cast-iron pipe makers, foundries and machine shops in this district continue to work on full time.

Chicago

Oct. 12—Quiet conditions exist in the iron market, but sales of pig iron are very general to founders if not of large amounts, and the selling element of the market has lost none of its confidence in the upward tendency of prices, though buyers are apparently more cautious. The general situation looks as if the melters had caught up with their requirements, prospective and immediate, and had resolved to go rather slowly for a time. That this is the situation appears from the fact that inquiries are considerably more numerous than sales, and are for iron to be delivered in the second quarter of the coming year. For the remainder of 1908 and for first-quarter deliveries, purchases are based on $15, Birmingham, for Southern No. 2 ($19.50, Chicago), and $19 for Northern No. 2, with Northern more active than Southern, because of its relatively lower price and ready supply from increased production. Lake Superior charcoal iron is steady and in good demand at $19.50@20. Much of the buying now being done is for first quarter, with scattering lots remaining in demand for the requirements of the last quarter of 1909. Some sales of Northern are made at $18.50, but they are few.

Sales of iron and steel products continue large, though some lines, such as structural material, show a lull. Railroad supplies, on the other hand, continue actively in demand. Coke is plentiful at $4.85 for the best Connellsville.

Philadelphia

Oct. 13—Eastern Pennsylvania pig-iron interests have not been disturbed during the past week by many large transactions, or by further advances on actual sales. A temporary resting stage has been reached. Most consumers have been buying liberally for some time past. This forward buying has been discouraged by the advances that have been made. The strongest on the list is basic pig, but at the present asking price only most urgent needs will be covered. The rising necessities of railroads for rails will affect bessemer and a further advance is regarded as probable. The furnace people are indulging in optimistic views and some managers believe that the larger concerns will not postpone very long the covering of requirements for at least half of 1910. Others express a less confident view. The movement in forge iron has subsided largely. Special brands of foundry are scarce and nominal quotations were advanced 50c. as there is no disposition to sell. No. 2X is quoted as high as $19; forge in some cases $18. Basic is strong at $18.50 per ton.

Pittsburg

Oct. 12—The volume of finished-steel business placed has shown a material falling off, but this is attributed to the fact that mills are indisposed to book orders for next year, sales for such delivery being conducted in a very conservative way. The tone of the market is strong, as buyers appear to expect high prices to prevail, but mills are afraid of speculative buying, and wish to restrict buying to asbolutely known requirements.

Pig Iron—The purchases of the Cambria Steel Company constituted the chief movement in bessemer in the past week. This company took from the Bessemer Pig Iron Association 11,000 tons at $18, Valley, for this quarter delivery and 38,000 tons at $18.50, Valley, for first quarter, a total of 49,000 tons. It also took from the association 3000 tons of basic at $17, Valley, for early delivery. From W. P. Snyder & Co., it took a fair tonnage of bessemer for this month's delivery at an advanced price. Another sale of 3000 tons of basic is recorded at $17, Valley, for early delivery, and a sale of 2000 tons of bessemer for November-December delivery at $18.50, Valley. Bessemer is quotable at $18.50@19, Valley, supplies available for any early delivery being very limited. It is doubtful if much basic could be had at $17, Valley, as high as $17.50 being quoted. Foundry iron has been decidedly quiet the past week or two, and the market is not as buoyant as it was, although it is not absolutely weaker. Consumers had bought heavily, and may have even overestimated their requirements, so that a quiet market is expected until the actual rate of melt increases. No. 2 foundry is quotable at $17, Valley, for prompt or fourth quarter and at $17.25@17.75 for next year, forge being 75c. to $1 below No. 2.

Steel—Unfinished steel has become scarcer and only odd lots can be picked up. Mills, generally speaking, are refusing to make prices for next year on billets, sheet-bars or rods. Nominal quotations, f.o.b. mill, may be named at $25@25.50 for bessemer billets, $26@26.50 for open-hearth billets, $31.50 for bessemer rods, $32 for open-hearth rods, $27 for bessemer sheet-bars and $28 for open-hearth sheet-bars.

Sheets—The market is firm at prices as advanced Sept. 28, with demand active and mills rather conservative as to selling ahead, and some producers quoting a premium on black sheets. Regular quotations are 2.30c. for black sheets, 3.35c. for galvanized, $1.60 for painted corrugated roofing and $2.85 for galvanized corrugated roofing, all 28 gage.

Metal Markets

New York, Oct 13—The metal markets have been rather irregular, showing strength in some directions, but in others inclining to weakness and slightly lower prices.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal.	Exports.	Imports.	Excess.
Gold:			
Aug. 1909..	$ 9,230,000	$ 5,349,000	Exp. $ 3,881,000
" 1908..	6,597,101	4,257,255	" 2,339,846
Year 1909..	89,726,119	28,754,477	" 60,971,642
" 1908..	64,960,348	33,614,330	" 31,346,018
Silver:			
Aug. 1909..	4,910,000	3,191,000	Exp. 1,719,000
" 1908..	4,130,853	3,194,426	" 936,427
Year 1909..	39,319,032	29,989,145	" 9,329,887
" 1908..	34,576,144	27,375,355	" 7,200,789

Exports from the port of New York, week ended Oct. 9: Gold, $100,000, to Brazil; silver, $750,418, chiefly to London. Imports: Gold, $110,589; silver, $44,774, both chiefly from Central and South America.

Gold—There was a good demand for gold on the open market in London, and quotations were 77s. 11⅜d. per oz. for bars, and 76s. 4¼d. per oz. for American coin.

Platinum—Business continues good, and dealers are inclined to add 25c. to the high price of $27 per oz. quoted last week for refined platinum. Hard metal is $30.50 per oz. For good scrap $22@23 per oz. is paid.

Our special correspondent reports from St. Petersburg, under date of Sept. 30, that an increase in prices is to be noted, as it has been expected by the principal dealers. From Ekaterinburg it is reported that there some crude platinum, 83 per cent. metal, was sold recently at 22,000 rubles per pood for Paris buyers. Small quantities are, however, to be obtained at the former price, at 5.25 rubles per zolotnik. In St. Petersburg the crude metal is quoted at 21,500@21,750 rubles per pood. These prices are equivalent to $19.74 and $21.19 per oz., respectively.

Silver—The market has shown a slight recession, owing in a measure to speculative sales. Inquiry continues and supplies are absorbed at current prices. The probability is that the market will continue fairly steady for the present.

SILVER AND STERLING EXCHANGE

Oct.	7	8	9	11	12	13
New York....	51⅜	51⅛	51⅛	51⅛	51⅛	51
London.....	23¾	23⅛	23⅛	23⅛	23⅛	23⅜
Sterling Ex..	4.8570	4.8570	4.8575	4.8580	4.8580	4.8590

New York quotations, cents per ounce troy, fine silver; London, pence per ounce sterling silver, 0.925 fine.

Exports of silver from London to the East, Jan. 1 to Sept. 30, as reported by Messrs. Pixley & Abell:

	1908.	1909.	Changes.
India.....	£7,324,163	£4,629,500	D. £2,694,663
China.....	516,400	1,555,200	I. 1,038,800
Straits....	112,385	82,800	D. 29,585
Total....	£7,952,948	£6,267,500	D. £1,685,448

Copper, Tin, Lead and Zinc

Oct.	Copper. Lake, Cts. per lb.	Copper. Electrolytic, Cts. per lb.	Copper. London, £ per ton.	Tin. Cts. per lb.	Lead. New York, Cts. per lb.	Lead. St. Louis, Cts. per lb.	Zinc. St. Louis, Cts. per lb.
7	13 @13¼	12⅝ @12⅞	58	30.45	4.32½ @4.35	4.20 @4.22½	5.82½ @5.85
8	12⅞ @13⅛	12⅝ @12⅞	58	30.45	4.32½ @4.35	4.20 @4.22½	5.85 @5.87½
9	12⅞ @13⅛	12⅝ @12⅞	....	30.40	4.32½ @4.35	4.20 @4.22½	5.85 @5.90
11	12⅞ @13⅛	12⅝ @12⅞	57⅛	30.35	4.32½ @4.35	4.20 @4.22½	5.87½ @5.90
12	.....	.....	57⅜	.....	.....	4.20 @4.22½	5.90 @5.92½
13	12⅞ @13⅛	12⅝ @12⅞	57⅛	30.35	4.32½ @4.35	4.20 @4.22½	5.92½ @5.95

London quotations are per long ton (2240 lb.) standard copper. The New York quotations for electrolytic copper are for cakes, ingots and wirebars, and represent the bulk of the transactions made with consumers, basis, New York, cash. The prices of casting copper and of electrolytic cathodes are usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

STATISTICS OF COPPER.

	September.	Nine Months.
Production in U.S.	118,023,139	1,038,290,585
Deliveries, domestic	52,105,155	500,852,602
Deliveries, foreign.	50,077,772	508,758,112
Total deliveries.	102,182,932	1,009,610,714
Stocks, U.S., Sept. 30	151,037,137	.....
Inc. in Sept....	15,840,207	.....
Stocks, Europe, Sept. 30.....	210,226,240	.....
Inc. in Sept....	12,617,920	.....

Figures are in pounds of fine copper. U. S. production includes all copper refined in this country, both from domestic and imported material.

Copper—The market is in rather an unsettled state. The publication of the monthly statistics with their increase in the domestic stocks of about 16,000,000 lb. did not make a marked impression, as they were not much worse than expectations. However, the tightening in the money rates has had a serious influence on weak speculative accounts, and a good deal of copper emanating from such sources has been thrown on the market and sacrificed at prices far below the ruling quotations. In the absence of a large demand from consumers, the policy of first hands has not developed. The concessions in prices so far have not been sufficient to attract buyers. The market closes weak at 12⅞@13⅛c. for Lake copper, and 12⅝@12¾c. for electrolytic copper in cakes, wirebars or ingots. Casting copper is quoted nominally at 12½@12¾ cents.

Copper sheets are 17@18c., base for large lots. Full extras are charged, and higher prices for small quantities. Copper wire is 14½c. base, carload lots at mill. Business continues on a good scale.

The standard market in London has been depressed throughout the week, quotations crumbling away from day to day. The close is somewhat steadier at £57 7s. 6d. for spot, and £58 7s. 6d. for three months.

Refined and manufactured sorts we quote: English tough, £61 10s.; best selected, £60 10s.@£61 10s.; strong sheets, £72 10s.@£73 10s. per ton.

Exports of copper for the week from New York and Philadelphia were 4490 long tons. Our special correspondent gives the exports from Baltimore at 626 tons of copper.

Copper Producers' Association—The report published Oct. 11 gives the following statement for September and the nine months ended Sept. 30, in pounds:

	September.	Nine Months.
Stocks, Sept. and Jan. 1.....	135,196,950	122,357,266
Refined in U. S.....	118,023,139	1,038,290,585
Total supplies.....	253,220,069	1,160,647,851
Deliveries, domestic..	52,105,155	500,852,602
Deliveries for export.	50,077,777	508,758,112
Total deliveries....	102,182,932	1,009,610,714
Stocks, Oct. 1.....	151,037,137	151,037,137
Inc. or dec. in stock..	I. 15,840,207	I. 28,679,871

Production includes all copper refined or put in marketable form in the United States, whether from domestic or foreign material. The September production was 2,574,095 lb. less than in July, while deliveries were 5,813,979 lb. less.

Tin—Owing to the tightness in the money market, tin was adversely affected. Throughout the week, the market showed heaviness in tone and a declining tendency, and the close is cabled at £137 15s. for spot, and £139 5s. for three months. This market is still characterized by an anxiety on the part of sellers to dispose of tin, in consequence of which sales at below import point are constantly being made. Business, however, is of small proportions only, and at the close the market can be called about 30¼@30⅜ cents.

A British consular report gives the tin production of Bolivia for 1908 at 29,937 long tons of *barilla*, or concentrates; equivalent to 23,962 tons metallic tin.

Arrivals of Bolivian tin ore and concentrates at Hamburg, Germany, in September are reported by Robertson & Bense at 805 long tons.

Lead—The market is quiet and unchanged at 4.32½@4.35c. New York, and 4.20@4.22½c. St. Louis.

The London market has been steady at £13 5s. for Spanish, and £13 7s. 6d. for English.

Spelter—The market is very firm and a good business is doing from day to day at advancing prices. Quotations at the close are 5.92½@5.95c. St. Louis, and 6.07½@6.10c. New York.

Quotations for spelter in New York, Oct. 7, were 5.97½@6c.; Oct. 8, 6@6.02½c.; Oct. 9, 6@6.05c.; Oct. 11, 6.02½@6.05c.; Oct. 13, 6.07½@6.10 cents.

The London market is unchanged at £23 5s. for good ordinaries, and £23 10s. for specials.

Base price of sheet zinc was advanced ¼c. on Oct. 9, to 7¾c. per lb., f.o.b. La-Salle-Peru, Ill., less 8 per cent. discount.

Other Metals

Antimony—Business is dull and prices unchanged at 8⅝@8¾c. for Cookson's; 8⅜c. for Hallett's; 8@8¼c. for U. S., and 7⅝@7⅞c. for outside brands.

Aluminum—No change can be reported. No. 1 ingots can be had at 20@23c. per lb. in large lots, with the American maker holding to the higher figure.

Quicksilver—Business continues good and prices are a little higher. In New York the quotation is $46@47 per flask of 75 lb. for large lots, while jobbers ask 65@66c. per lb. for small quantities. San Francisco prices are $44@45 for domestic business, and $2 less for export orders. The London price has been advanced 5s. to £8 12s. 6d. per flask, with £8 10s. quoted by jobbers.

Magnesium—The price of pure metal is $1.50 per lb. for 100-lb. lots f.o.b. New York.

Nickel—Large lots, contract business, 40@45c. per lb. Retail spot, from 50c. for 2000-lb. lots, up to 55c. for 500-lb. lots. The price for electrolytic is 5c. higher.

Cadmium—Current quotations are 75c. per lb. in 100-lb. lots at Cleveland, Ohio. In Germany 450@475 marks per 100 kg., at factory in Silesia.

Spanish Metal Exports

Exports of metals and minerals from Spain, six months ended June 30; reported by *Revista Minera*, in metric tons:

Metals.	1908.	1909.	Changes.
Pig and manuf. iron	18,283	35,838	I. 17,555
Copper	8,508	10,796	I. 2,288
Copper precipitate	10,083	12,598	I. 2,515
Lead	110,055	103,682	D. 6,373
Zinc	812	874	I. 62
Quicksilver	1,491	1,484	D. 7
Minerals.			
Iron ore	4,624,424	4,537,432	D. 86,992
Manganese ore	13,791	7,065	D. 6,726
Copper ore	711,722	655,159	D. 56,563
Lead ore	1,911	2,188	I. 277
Zinc ore	65,087	74,889	I. 9,802
Pyrites	873,883	765,361	D. 108,522
Salt	396,782	390,552	I. 6,230

Imports of phosphate rock, 46,555 tons in 1908, and 40,626 in 1909; decrease, 5929 tons.

Zinc and Lead Ore Markets

Joplin, Mo., Oct. 9—The highest price was $52.50 per ton for one bin of 63 per cent. zinc ore, the general high price being $52. On the assay base one bin sold at $49.50. An increased tonnage sold on a base of $48.50 and $49 per ton of 60 per cent. zinc. Zinc silicate sold on a base price of $23@24.50 per ton of 40 per cent. zinc, the highest price being $29.50 per ton. The average price, all grades, was $44.88. Lead ore sold on a base price of $55 per ton of 80 per cent. lead in the bin, the highest price reported being $56.40, with medium grades selling at $54. The average price, all grades, was $54.72 per ton.

Shipments are curtailed from lack of cars for loading. A large portion of the salable stock in the bins has been sold and will be moved as speedily as transportation facilities will permit.

SHIPMENTS, WEEK ENDED OCT. 9.

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville	3,556,560	458,760	$ 96,194
Joplin	1,530,340	226,450	43,282
Prosperity	582,450	203,250	19,276
Galena	551,930	67,700	14,829
Duenweg	534,200	77,070	14,135
Alba-Neck	538,660	.....	13,466
Jackson	270,880	193,120	11,541
Quapaw	324,270	89,040	9,376
Carthage	372,910	.....	9,322
Aurora	584,350	70,840	9,265
Badger	349,170	.....	8,380
Miami	388,610	51,050	8,179
Spurgeon	336,650	43,660	6,778
Sarcoxie	296,900	....	6,576
Granby	282,400	14,000	5,545
Oronogo	199,600	53,820	5,536
Zincite	204,660	.....	5,059
Cave Springs	167,360	.. ...	3,933
Shoalsburg-Saginaw	171,090	2,710	3,774
Carl Junction	133,910	.....	3,340
Totals	11,376,900	1,551,470	$297,786
41 weeks	461,933,300	69,589,620	$10,972,392

Zinc value, the week, $255,323; 41 weeks, $9,074,622
Lead value, the week, 42,463; 41 weeks, 1,897,770

MONTHLY AVERAGE PRICES.

Month.	Zinc Ore. Base Price.		Zinc Ore. All Ores.		Lead Ore. All Ores.	
	1908.	1909.	1908.	1909.	1908.	1909.
January	$37.60	$41.25	$35.56	$38.46	$46.88	$52.17
February	36.63	36.94	34.92	34.37	49.72	50.50
March	36.19	37.40	34.19	34.71	49.90	50.82
April	35.40	38.63	34.08	37.01	52.47	55.63
May	34.19	40.06	33.39	37.42	56.05	56.59
June	33.06	44.15	32.07	40.35	60.48	57.52
July	34.55	43.06	31.67	41.11	59.90	53.74
August	36.53	48.25	33.42	44.54	60.34	57.60
September	37.63	47.70	34.44	44.87	54.59	56.11
October	35.95	.....	33.28	.....	52.63	.....
November	39.13	.....	35.02	.....	54.53	.....
December	42.75	.....	39.63	.....	49.68	.....
Year	$36.63	.....	$34.31	.....	$53.93	.....

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

Platteville, Wis., Oct. 9—The highest price paid this week for zinc ore was $49.50 per ton; the base price, 60 per cent. zinc, was $48.50@49. The base price paid for lead ore was $56@57 per ton.

SHIPMENTS, WEEK ENDED OCT. 9.

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Hazel Green	477,400	.....	38,100
Benton	403,730	.....	.....
Days Siding	400,000	.....	.....
Highland	318,500	78,500	303,900
Platteville	312,190	.....	.....
Linden	216,620	.....	.....
Cuba City	171,765	85,220	.....
Harker	158,950	.....	.....
Shullsburg	140,000	60,000	.....
Galena	84,000	.....	.....
Rewey	54,300	.....	.....
Total	2,737,455	223,720	342,000
Year to Oct. 9	106,324,655	6,773,575	10,187,845

In addition to the above there was shipped to the American Zinc Ore Separating Company, 440,640 lb., and to the Joplin Separator Works, 174,850 lb. zinc concentrates.

Chemicals

New York, Oct. 13—The markets show little or no change since last week's report. Outside of contract business trading was rather light and prices are generally stationary.

Copper Sulphate—Business is not especially active, and prices are a shade lower at $4 per 100 lb. for carload lots and $4.25 per 100 lb. for smaller parcels.

Arsenic—There has been little business during the week. Quotations for white arsenic are 2.70@2.75c. per lb. for spot, while 2⅞c. per lb. is asked for next year's delivery.

Nitrate of Soda—The market is dull, with quotations at 2.10c. per lb. for both spot and futures.

Potash Salts—The remaining members of the Kali-Syndikat, according to Berlin despatches, propose to act aggressively against the mines which are now controlled by American concerns through ownership or contract. One measure suggested is a special tax on the production of mines worked for foreign account, but it seems improbable that such a step will be taken. It is understood that a special committee has been appointed to visit this country and to organize competition here.

Mining Stocks

New York, Oct. 13—This week was broken by a holiday again, the new "Columbus Day" coming in this year for the first time in New York. The market for the whole week was generally confused, with a downward tendency and a good deal of liquidation going on. It was further depressed by advancing rates for money, and the probability that a stiffer money market may be expected for some time.

There was one sale of Homestake, of South Dakota, during the week, at $91.12½ per share.

The Curb market followed the Exchange for the most part and was depressed and irregular. Copper shares were affected by the Producers' report, showing an increase in stocks, though this had been largely discounted. There was some excitement in Cobalts, brought over from the preceding week, but most of the stocks gained. On the whole, it was rather an unprofitable week.

Boston, Oct. 12—Copper shares are in the dumps but at that they are marking time and awaiting a rift in the horizon. The continued accumulation of copper supplies, both in this country and abroad, has taken about all the bullish enthusiasm out of holders of these securities. The only favorable thing of the present time is the disinclination to part with holdings, and as there is little or no demand, prices

do not go off much. The issue of the Copper Producers' report, showing increased supplies for September, brought some selling by traders, but they were timid in their commitments. Money has been an unsettling factor and rates for call loans are practically on a 5 per cent. basis.

The Boston Stock Exchange ran it alone today. Practically all the other stock exchanges throughout the country suspended on account of the observance of Columbus Day in New York. The result was a quiet day with but little price variation. For the week prices are off. Calumet & Hecla is off $25 for the period to $640 and Calumet & Arizona broke $5.25 to $97.75, but offerings were light in both cases. Atlantic is selling plus the $2 assessment called a short time ago and brought $10.75 yesterday.

Lake Copper has had both strong and weak periods, although the net result for the week is a $2.37½ decline to $35.50. Disappointment at the delay in starting the Arizona Commercial Company's smeltery has caused a $3 drop to $43.37½. A sharp demand for Greene-Cananea put the price up to $10.87½. North Butte is lower by $2.87½ at $58, Osceola by $3.50 at $153.50.

Amalgamated is off about $3.50 to $79. North Lake made low at $6.75.

Rhode Island Coal had a break on the Curb from $11.50 to $9.50, but has recovered the greater part of it. First National and Davis-Daly have both held close to $6 per share.

STOCK QUOTATIONS

NEW YORK	Oct. 13	BOSTON	Oct. 13
Name of Comp.	Clg.	Name of Comp.	Clg.
Alaska Mine	‡.11	Adventure	6
Amalgamated	79⅜	Allouez	67
Anaconda	46½	Am. Zinc	‡34¼
Balaklala	‡2 1/16	Arcadian	4
British Col. Cop.	6¾	Arizona Com.	43⅜
Buffalo Mines	3½	Atlantic	8½
Butte Coalition	25⅜	Boston Con.	14¾
Colonial Silver	‡ 1/16	Calumet & Ariz.	100
Cum. Ely Mining.	6¾	Calumet & Hecla	640
Davis-Daly	5¾	Centennial	37½
Dominion Cop.	7	Copper Range	79⅛
Douglas Copper	1	Daly-West	8
El Rayo	2 1/16	East Butte	11½
Florence	3	Franklin	16
Foster Cobalt	‡.32	Greene—Can.	10½
Furnace Creek	‡.05	Hancock	12½
Giroux	9	Isle Royal	23¾
Gold Hill	⅛	Keweenaw	2¾
Goldfield Con.	6 1/16	La Salle	14½
Granby	‡95	Mass	7
Greene Gold	‡⅛	Michigan	9
Greene G. & S.	‡9	Mohawk	60
Guanajuato	2¾	Nevada	23½
Guggen. Exp.	215	North Butte	58½
Hanapah	‡15	Ojibway	8
Kerr Lake	8 1/16	Old Colony	.60
McKinley-Dar.	.91	Old Dominion	.52
Miami Copper	15½	Osceola	154½
Micmac	1/16	Parrot	30½
Mines Co. of Am.	⅛	Quincy	87
Montezu. of C. R.	15	Rhode Island	‡4¾
Mont. Sho. C.	1⅜	Shannon	15⅝
Nev. Utah M. & S.	1⅜	Superior	57
Newhouse M. & S.	3½	Superior & Bost.	14¼
Nipissing Mines.	11½	Superior & Pitts.	15⅛
Old Hundred	½	Tamarack	70
Silver Queen	.36	Trinity	10½
Stewart	1/16	U. S. Smg. & Ref.	55¼
Tennessee Cop'r.	33⅛	U.S.Sm. & Re., pd.	52⅞
Tri-Bullion	⅜	Utah Con.	42¾
United Copper	10	Victoria	3¾
Utah Apex	‡4⅛	Winona	6¾
Utah Copper	47	Wolverine	149
Yukon Gold	5 1/16	Wyandotte	2

‡Last quotation. ‡Last quotation.

N. Y. INDUSTRIAL	
Am. Agri. Chem.	45¾
Am. Smelt. & Ref.	95⅜
Am.Sm. & Ref., pf.	111⅝
Colo. Fuel & Iron.	44¼
Federal M. & S., pf.	80
National Lead	86½
National Lead, pf.	‡111
Pittsburg Coal	‡18½
Republic I. & S.	‡45½
Republic I. & S., pf.	106⅛
Sloss-Sheffield	91
Standard Oil	‡685
U. S. Steel	86⅛
U. S. Steel, pf.	126⅞
Va. Car. Chem.	45¼

BOSTON CURB	Low.
Ahmeek	210
Chemung	16¾
Chino	7⅛
Gila	8
Indiana	5⅛
Mason Valley	2
Ray Central	2⅛
Ray Con	18¾
San Antonio	8
Yuma	1⅛

Furnished by Hornblower & Weeks, N. Y.

ST. LOUIS	Oct. 9	
N. of Com.	High.	Low.
Adams	.40	.30
Am. Nettie.	.10	.07
Center Cr'k	1.90	1 60
Cent.C.&C.	84 00	83 00
C.C. & C. pf.	83.00	82 00
Cent. Oil	110 00	100 00
Columbia	9.00	7 00
Con. Coal	18 00	17 00
Doe Run	115.00	105 00
Gra. Bimet.	.30	.25
St. Joe	12.50	11.00

LONDON	Oct. 13		
Name of Com.	Clg.		
Dolores	£1	5s	0d
Stratton'sInd.	0	3	3
Camp Bird	1	10	0
Esperanza	2	18	0
Tomboy	0	19	6
El Oro	1	5	6
Oroville	0	14	0

Cabled through Wm. P. Bonbright & Co., N. Y.

NEVADA STOCKS. Oct. 13.
Furnished by Weir Bros. & Co., New York.

Name of Comp.	Bid.	Name of Comp.	Bid.
COMSTOCK STOCKS		Silver Pick	.11
Belcher	1.00	St. Ives	.05
Best & Belcher	‡ 59	Triangle	.01
Caledonia	‡ 41	BULLFROG STOCKS	
Chollar	.38	Gibraltar	.02
Comstock	‡.28	Homestake King.	‡.01
Con. Cal. & Va.	1 75	Mont. Shoshone C.	1.50
Crown Point	‡.86	Tramp Cons.	.04
Exchequer	.43	MISCELLANEOUS	
Gould & Curry	.44	Cumberland Ely.	6.50
Hale & Norcross.	.76	Giroux	8.62½
Mexican	2.47½	Greenwa'r Copper	03
Ophir	2 15	Nevada Con.	23.50
Overman	‡.75	Nevada Hills	.70
Potosi	83	Navada Smelting.	.75
Savage	75	Nevada Wonder.	.55
Sierra Nevada	.84	Nevada-Utah	1.62½
Union	1.10	Penn-Wyoming	...
Utah	‡.05	Pittsburgh S. Pk.	65
Yellow Jacket	1 60	Ray Central	2.06¼
TONOPAH STOCKS		Ray Con	18.75
Belmont	.75	Round Mt. Sphinx	05
Extension	.50		
Golden Anchor	...		
Jim Butler	.11		
MacNamara	.29		
Midway	.18		
Montana	.90		
North Star	.02		
Tono'h Mine of N.	6.62½		
West End Con.	.26		
GOLDFI'D STOCKS			
Adams	.01		
Atlanta	.11		
Blue Bell	.02		
Booth	.10		
C.O.D. Con.	.05		
Columbia Mt.	.08		
Comb. Frac.	.73		
Cracker Jack	.01½		
Dia'dfield B. B. C.	.01		
Florence	2.87½		
Goldfield Belmont	.04		
Goldfield Daisy	07½		
Great Bend	.04		
Jumbo Extension	13		
Kendall	02		
Lone Star	.02		
May Queen	04		
Oro	.04		
Red Hill	.04		
Sandstorm	05		

COLO. SPRINGS	Oct. 8
Name of Comp.	Clg.
Acacia	‡.07¼
C. C. Con	‡ 03¼
Doctor	.08½
Elkton	.74
El Paso	.60
Findlay	.10¾
Gold Dollar	13½
Gold Sovereign	‡.04¾
Isabella	.16½
Jack Pot	‡.08¾
Jennie Sample	.07¾
Jerry Johnson	.06½
Lexington	‡.01¾
Mary McKinney	‡ 46¼
Old Gold	.04½
Pharmacist	.03⅜
Portland	.83
U. G. M.	.08
Vindicator	.73
Work	.07

Assessments

Company.	Delinq.	Sale.	Amt.
Alameda M. & M., Ida.	Oct. 7	Nov. 4	$0.005
Alta Gladstone, Utah	Sept. 15	Oct. 20	0.00½
Black Traveler Copper, Ida.	Sept. 27	Oct. 27	0.005
Brunswick Con. Va., Nev.	Oct. 1	Oct. 22	0.02
Bullion, Nev.	Oct. 7	Oct. 25	0.05
Caledonia, Nev.	Oct. 21	Nov. 11	0.10
Challenge Con., Nev.	Sept. 28	Oct. 18	0.10
Dennemora G. & C., Ida.	Oct. 1	Oct. 18	0.001½
Hale & Norcross, Nev.	Sept. 21	Oct. 11	0.10
Hancock Con., Mich.	Oct. 10		1.00
Idaho North Star, Ida.	Oct. 23	Nov. 15	0.01
Julia Con., Nev.	Oct. 14	Nov. 8	0.03
Pawhattan, Ida.	Oct. 7	Nov. 8	0.001
San Antonia Copper, Mex.	Dec. 1		1.00
Sheba G. & S. Mining, Utah	Sept. 28	Oct. 30	0.05
Sierra Nevada, Nev.	Oct. 12	Nov. 3	0.10
Silver King Con., Utah	Oct. 4	Oct. 23	0 10
So. Columbus Con., Utah	Sept. 20	Oct. 20	0 000½
Square Deal M. & M., Ida.	Oct. 14	Nov. 4	0.001
St. Louis, Nev.	Oct. 22	Nov. 12	0.01
Utah, Nev.	Oct. 26	Nov. 16	0.05

Monthly Average Prices of Metals

SILVER

Month.	New York.		London.	
	1908.	1909.	1908.	1909.
January	55.678	51.750	25.738	23.834
February	56.000	51.472	25.855	23.706
March	55.365	50.468	25.570	23.227
April	55.505	51.428	25.133	23.708
May	52.795	52.905	24.377	24.343
June	53.663	52.538	24.760	24.166
July	53.115	51.043	24.514	23.519
August	51.683	51.125	23.858	23.588
September	51.720	51.440	23.877	23.743
October	51.431	.....	23.725	.....
November	49.647	.....	22.933	.....
December	48.766	.....	22.493	.....
Total	52.864	.....	24.402	....

New York, cents per fine ounce; London, pence per standard ounce.

COPPER

	NEW YORK.				LONDON.	
	Electrolytic		Lake.			
	1908.	1909.	1908.	1909.	1908.	1909.
January	13.726	13.893	13.901	14.280	62.386	57.688
February	12.905	12.949	13.098	13.295	58.786	61.198
March	12.704	12.387	12.875	12.826	58.761	56.231
April	12.743	12.56½	12.928	12.93¾	58.331	57.363
May	12.598	12.893	12.788	13.238	57.387	59.338
June	12.675	13.214	12.877	13.548	57.842	59.627
July	12.702	12.880	12.933	13.363	57.989	58.556
August	13.462	13.007	13.639	13.296	60.500	59.393
September	13.388	12.870	13.600	13.210	60.338	59.021
October	13.354	.....	13.646	.....	60.139	....
November	14.130	.....	14.386	.....	63.417	.....
December	14.111	.....	14.411	.....	62.943	.....
Year	13.208	.....	13.424	.....	59.902	.....

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling, per long ton, standard copper.

TIN AT NEW YORK

Month.	1908.	1909.	Month.	1908.	1909.
January	27.380	28.060	July	29.207	29.125
February	28.978	28.290	August	29.942	29.966
March	30.577	28.727	September	28.815	30.298
April	31.702	29.445	October	29.444	....
May	30.015	29.225	November	30.348	....
June	28.024	29 322	December	29.154	...
			Av. year	29.465	....

Prices are in cents per pound.

LEAD

Month.	New York.	St. Louis	London.		
	1909.	1909.	1909.	1908.	1909.
January	3.691	4.175	4.025	14.469	13.113
February	3.725	4.018	3.868	14.250	13.313
March	3.838	3.986	3.835	13.975	13.438
April	3.993	4.168	4.051	13.469	13.297
May	4.253	4.287	4 214	12.938	13.225
June	4.466	4.350	4 291	12.600	13.031
July	4.744	4.321	4.188	13.000	12.563
August	4.580	4.363	4.227	13.375	12.475
September	4.515	4.342	4.215	13.125	12.781
October	4.351	.....	.....	13.375	...
November	4.330	.....	.....	13.538	.....
December	4.213	.....	.....	13.156	.....
Year	4.200	.....	.....	13.439	....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month.	New York.		St. Louis.		London.	
	1908.	1909.	1908.	1909.	1908.	1909.
January	4.513	5.141	4.363	4.991	20.563	21.425
February	4.788	4.889	4.638	4.739	20.875	21.563
March	4.665	4.757	4.527	4.607	21.075	21.438
April	4.645	4.965	4.495	4.815	21.344	21.531
May	4.608	5.124	4.458	4.974	19.906	21.975
June	4.543	5.402	4.393	5.252	19.000	22.000
July	4.485	5.402	4.338	5.252	19.031	21.969
August	4.702	5.729	4.556	5.579	19.350	22.125
September	4.769	5.796	4.619	5.646	19.563	22.906
October	4.801	.....	4.651	.....	19.750	.....
November	5.059	.....	4.909	.....	20.875	.....
December	5.137	.....	4.987	.....	20.625	..
Year	4.726	.....	4.578	.....	20.163	....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.